



**The Psychological Effects  
of Anti-Personnel Landmines:  
A Standard to which  
Alternatives can be Compared**

Eugenia M. Kolasinski, Ph.D.



**Engineering Psychology Laboratory Report 99-2**  
April 12, 1999

Engineering Psychology Laboratory  
Department of Behavioral Sciences and Leadership  
United States Military Academy  
West Point, NY 10996-1784

*Distribution Statement A:  
Approved for public release. Distribution is unlimited.*

DTIC QUALITY INSPECTED 4

19991220 054

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503				
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE  12 APR 99		3. REPORT TYPE AND DATES COVERED  Final JUN 98 - DEC 98
4. TITLE AND SUBTITLE The Psychological Effects of Anti-Personnel Landmines: A Standard to which Alternatives can be Compared			5. FUNDING NUMBERS  W15BW9800542	
6. AUTHOR(S) Eugenia M. Kolasinski				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) United States Military Academy Department of Behavioral Sciences & Leadership ATTN: MADN-BSL Bldg 601, Room 281 West Point, NY 10996-1784			8. PERFORMING ORGANIZATION REPORT NUMBER  Engineering Psychology Laboratory Report 99-2	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Department of the Army Office of the Project Manager Mines, Countermines and Demolitions Picatinny Arsenal, NY 07806-5000			10. SPONSORING/MONITORING AGENCY REPORT NUMBER  ---	
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION/AVAILABILITY STATEMENT Distribution Statement A: Approved for public release. Distribution is unlimited			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words)  On September 17, 1997, President Clinton announced that, by the year 2003, the U.S. will no longer use anti-personnel landmines (APLs) outside of Korea and, within Korea, the goal is to have APL alternatives ready by 2006. It is desired that APL alternatives have the same psychological effects as APLs without the negative humanitarian aspects. However, in order to replicate the psychological effects of APLs, those effects must first be identified. This study sought to provide input regarding the effects of APLs on soldiers when they are used in military operations. A two-phased approach was employed. The first phase consisted of a review of the open literature to determine what research had already addressed this issue and what such research found. The second phase was an exploratory investigation into APL effects on individuals who had experience with them, primarily in a non-training situation. This study makes four primary conclusions regarding the psychological effects of APLs. Although not the focus of this study, the operational effects of APLs were also explored and there are five primary conclusions regarding the operational effects. Overall, this study offers five primary conclusions related to the development and evaluation of APL alternatives. Areas for future research are also suggested.				
14. SUBJECT TERMS  landmine anti-personnel landmine psychological effect			15. NUMBER OF PAGES  67	
			16. PRICE CODE  ---	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT Unlimited	

## Acknowledgments

The author would like to thank the following individuals for their contribution to this project:

Dr. Don Barr and Dr. John Farr of the Department of Systems Engineering at the United States Military Academy (USMA). Without their assistance, support, and guidance, this project would never have been possible.

Mr. Dave Panhorst and Mr. Marc Strano at Picatinny Arsenal for taking a chance on and entrusting their project to a researcher they did not know - hopefully, they were not disappointed; also, for reviewing drafts of this report and supporting this work so completely.

LTC Craig Leeker of the Department of Behavioral Sciences & Leadership (BS&L) at USMA for all of his assistance throughout the conduct of this research.

MAJ Brian Baker, Dr. Greg Bier, Dr. Alan Davison, COL Robert J. Greenwalt, CPT Kevin Gullick, LTC Lauren Leeker, MAJ Ed Mazion, Mr. Jim Smith, and Mr. Jeb Stuart, all of whom assisted with some aspect of this project, provided insights or words of wisdom, or, in general, went above and beyond the call of duty to aid in this research effort.

Ms. Anita Howington and Ms. Mary Jane Ward of BS&L at USMA for their never-ending patience in assisting with all of the details of carrying out this project; also Ms. Ward for reviewing a draft of this report.

COL Charles Brower of BS&L at USMA for his personal support of this research project.

Ms. Julie Chu and MAJ Ted Jennings at Picatinny Arsenal for reviewing drafts of this report.

The Department of BS&L at USMA for the use of its equipment and facilities.

CPT Ronald Schmidt for his constant support, advice, and assistance throughout the course of this project.

Mr. Eugene and Mrs. Helen Kolasinski for their support throughout the course of this project.

All of the people who took the time to send comments, feedback, copies of articles, references, or any other type of information which in some way contributed to this research. The author greatly appreciates their time and input and is more knowledgeable because of their efforts.

Each and every person who took the time to complete the survey and/or pass it on to someone else who completed it. The author is greatly indebted to them for sharing their insights and personal experiences. This project would have been grossly lacking were it not for their efforts.

This work was conducted during the period June 1998 through December 1998 for the Department of the Army, Office of the Project Manager Mines, Countermine, and Demolitions, Picatinny Arsenal, NJ 07806-5000. The methodology and results contained herein are solely those of the author and do not purport to reflect the position, policy, or decision of the Department of Behavioral Sciences & Leadership, United States Military Academy, Department of the Army, or Department of Defense.

## Executive Summary

### Requirement

On September 17, 1997, President Clinton announced that, by the year 2003, the U.S. will no longer use anti-personnel landmines (APLs) outside of Korea and, within Korea, the goal is to have APL alternatives ready by 2006. In October 1997, the Deputy Secretary of Defense directed all elements of the Department of Defense to implement the President's policy. To meet this goal, efforts are currently underway for the awarding of contracts for assessment testing, engineering, and, eventually, production of APL alternatives.

Employment of APL alternatives will likely change the battlefield of the future. It is desired that alternatives have the same psychological effects as APLs but without the negative humanitarian aspects. However, in order to replicate the psychological effects of APLs, those effects must first be identified. Once the target psychological effects are determined, the psychological effects of alternatives can be determined and the two then compared.

With the recent press concerning the proposed ban on APLs, a fair amount of literature in a variety of publications has been devoted to the effects - both psychological and otherwise - of APLs on civilian populations and victims. These results, however, primarily focus on the *post-incident* effects of mines: in other words, the effects of mines after hostilities in an area have ended or after an individual - usually a civilian - falls victim to a mine. This study, on the other hand, sought to determine the effects of APLs on soldiers when they are used in military operations.

The proposed worldwide ban on APLs is an emotionally charged issue that is currently the subject of heated debate in the international arena. **It is specifically emphasized that *this paper does not take a stand on whether or not APLs should or should not be banned!*** This report stems from President Clinton's September 17, 1997 announcement. Given his stated goal, this report aims to provide input regarding what is necessary to know about APLs in order to replicate their psychological effects.

### Procedure

This project involved a two-phased approach. The first phase consisted of a review of the open literature to determine what research had already addressed this issue and what such research found. Although many references are made to the "psychological effects" of landmines, it was apparent early in the project that no previous study in the open, available literature has been conducted to specifically measure or document the exact nature of the psychological effects of enemy APLs on soldiers. This necessitated the second phase.

The second phase of this project was an exploratory investigation into the effects of APLs on individuals who had experience with them, primarily in a non-training situation. A survey was distributed via email to three groups of individuals: all personnel at the United States Military Academy (excluding cadets), all attendees of the 1998 Mines, Countermines & Demolitions Symposium and Exhibition, and individuals



knowledgeable in the area of APLs and mine warfare. Some survey recipients forwarded the survey to other current or former military personnel at various places around the world. The survey was sent to 3315 individuals in the first group, successfully reached 143 individuals in the second group, and was sent to approximately 10 individuals in the third group. With the four distribution methods, it is unclear exactly how many individuals the survey reached, but it was sent to at least 3468 individuals consisting of an unknown percentage of individuals with the desired APL experience. Ninety-nine individuals responded.

Use of this survey proved to be a very valuable mechanism for obtaining assessments of APL effects from individuals who were affected by them. The simple instrument gathered data on current rank and branch, information regarding the respondent's experience with APLs (the situation/conflict and rank and branch at the time), and responses to two free-response questions. The first question addressed the respondent's perception of the psychological effects of APLs and the second addressed the perception of their operational effects in the situation/conflict. Because it was unknown *a priori* what to expect from distribution of the survey, no formal inferential statistical analyses were planned or carried out. Analysis consisted of summarizing the responses.

### **Conclusions**

This study led to four primary conclusions regarding the psychological effects of APLs:

1. APLs do not always cause significant psychological effects.
2. The primary psychological effect of APLs is fear but other emotions are also possible.
3. The major factors involved in the psychological effects of APLs are control, the inability to fight back against them, risk, and uncertainty.
4. The fear induced by APLs is most likely primarily caused by the types of injuries they inflict and the certainty of those injuries if a mine detonates.

Although not the focus of this study, the operational effects of APLs were also tangentially explored. Overall, there were five primary conclusions regarding the operational effects of APLs.

1. Typically, APLs do not completely stop a mission.
2. APLs almost always have some sort of operational effect. Overall, they constrain and slow.
3. The type of mission plays an important role in the specific operational effects of APLs.
4. A primary aspect of the operational effects of APLs is the cascading nature of their effects.
5. The exact nature of the operational effects of APLs in a given situation is a complicated function of many factors. The perceived operational effectiveness of APLs may be an important psychological effect in and of itself.

## **Utilization of Findings**

In terms of the development and evaluation of APL alternatives, there are five primary conclusions:

1. Based on the major factors involved in the psychological effects of APLs, it is proposed that alternatives need to be a threat that the enemy would deem unable to control, would involve a high degree of uncertainty and risk, and would not allow the enemy the ability to "fight back."
2. Exact replication of the fear associated with APLs appears to hinge on the permissible lethality and maiming capability of alternatives. The results of this research suggest that exact replication of the psychological effects of APLs is likely possible only if alternatives have maiming and lethality capability. If such capabilities are not permitted, the results of this research suggest that it is likely impossible to exactly replicate all of the psychological effects of APLs and may be very difficult to replicate any of them.
3. An alternative to the exact replication of some or all of the psychological effects of APLs is replication of specific operational effects of APLs with or without the psychological ones. Different means may be needed to replicate different operational effects and the type of mission may play a role in the desired operational effect and achievement of it. In addition, expecting any alternative to completely stop a mission may be unrealistic given that APLs themselves typically do not.
4. Any APL alternative should have high efficacy in the minds of the force that is using it.
5. A paradigm shift in U.S. military strategy and operation may be the only recourse to a comprehensive ban on the use of APLs and the employment of alternatives.

## **Future Research**

This study suggests several topics for future research regarding the psychological effects of APLs:

- quantification of the effects in order to determine, for example, which effects are most common or the reliability of effects.
- identification and isolation of the causes of the effects.
- investigation of the effects of U.S. APLs on foreign soldiers; also, investigation of the effects of APLs on the force using them.
- investigation of possible differences in effects on soldiers of different branches or ranks.
- assessment of immediate effects in a controlled setting, perhaps using some sort of objective measure.
- examination and comparison of effects in different situations/conflicts; also investigation of effects of repeated APL experiences on both individual soldiers and entire units.

## Table of Contents

<b><u>EXECUTIVE SUMMARY</u></b>	<b><u>II</u></b>
<b><u>LIST OF TABLES</u></b>	<b><u>VII</u></b>
<b><u>INTRODUCTION</u></b>	<b><u>1</u></b>
<b><u>LITERATURE REVIEW</u></b>	<b><u>2</u></b>
<b>OPERATIONAL EFFECTS</b>	<b>2</b>
Military Utility	3
Operational Effectiveness	4
<b>PHYSIOLOGICAL EFFECTS</b>	<b>8</b>
<b>PSYCHOLOGICAL EFFECTS</b>	<b>9</b>
<b><u>METHOD</u></b>	<b><u>13</u></b>
<b>PARTICIPANTS</b>	<b>13</b>
<b>INSTRUMENT</b>	<b>14</b>
<b>ANALYSIS</b>	<b>14</b>
<b><u>RESULTS</u></b>	<b><u>14</u></b>
<b>DEMOGRAPHICS</b>	<b>14</b>
<b>PSYCHOLOGICAL EFFECTS</b>	<b>19</b>
Little/No Psychological Effect	19
Fear	20
Emotions Other Than Fear	21
Elements of the Psychological Effects	23
Desensitization	24
Training, Experience and Equipment	25
Lasting Effects	26
Injuries	27
Mine Incidents and Their Psychological Effects	27
Psychological Effects of UXO	28
Psychological Effects of Friendly Mines	29
<b>OPERATIONAL EFFECTS</b>	<b>30</b>
Little/No Operational Effect	30
Changes to the Mission	31
Elements of Mission Change	31



## **List of Tables**

1. Frequencies for Current Ranks of Respondents \_\_\_\_\_ 15
2. Frequencies for Current Branches of Respondents \_\_\_\_\_ 15
3. Frequencies for Ranks of Respondents at the Time of Their Landmine Experience \_\_\_\_\_ 16
4. Frequencies for Branches of Respondents at the Time of Their Landmine Experience \_\_\_\_\_ 17
5. Frequencies for the Situation/Conflict during which the Respondents Encountered APLs \_\_ 18

## Introduction

*In peacetime it is all too easy to underplay the significance of mines. To the crew of a 50-ton tank traveling at best speed, white tape and an umpire more concerned for his personal safety than representing the effectiveness of his obstacle, mines present no problem. Given some live mines and the same crew, the situation would be very different. Dash would be replaced by caution, determination by prudence and contempt by a healthy respect. The psychological effect of mines is then a factor of considerable importance in itself.*

- General Sir Nigel Bagnall  
(in Sloan, 1986, p. v)

On September 17, 1997, President Clinton announced that, by the year 2003, the U.S. will no longer use anti-personnel landmines (APLs) outside of Korea and, within Korea, the goal is to have APL alternatives ready by 2006 (White House, 1997). In October 1997, the Deputy Secretary of Defense directed all elements of the Department of Defense (DOD) to implement the President's policy. To meet this goal, efforts are currently underway for the awarding of contracts for assessment testing, engineering, and, eventually, production of APL alternatives.

Employment of APL alternatives will likely change the battlefield of the future. It is desired that alternatives have the same psychological effects as APLs but without the negative humanitarian aspects. However, in order to replicate the psychological effects of APLs, those effects must first be identified. Once the target psychological effects are determined, the psychological effects of alternatives can be determined and the two then compared.

With the recent press concerning the proposed ban on APLs and the awarding of the 1997 Nobel Peace Prize to the International Campaign to Ban Landmines and its coordinator, Jody Williams (Goldberg, 1997), a fair amount of literature in a variety of publications has been devoted to the effects - both psychological and otherwise - of APLs on civilian populations and victims (e.g., Arms Project of Human Rights Watch & Physicians for Human Rights, 1993; Bier, Grzyb, & Stevens, 1998; Human Rights Watch Arms Project & Human Rights Watch/Africa, 1994; International Committee of the Red Cross, 1996; Jegen, 1997; Stover, Keller, Cobey, & Sopheap, 1994; Strada, 1996; U.S. Department of State, 1993, 1994; Webster, 1994). These results, however, primarily focus on the *post-incident* effects of mines: in other words, the effects of mines after hostilities in an area have ended or after an individual - usually a civilian - falls victim to a mine. This study, on the other hand, sought to determine the effects of APLs on soldiers when they are used in military operations.

This project involved a two-phased approach. The first phase consisted of a review of the open literature to determine what research had already addressed this issue and what such research found. Although many references are made to the "psychological effects" of landmines, it was apparent early in the project that no previous study in the open, available literature (i.e., journal articles, technical reports, and other such documents that are indexed by major databases and readily obtainable) has been



conducted to specifically measure or document the exact nature of the psychological effects of enemy APLs on soldiers. This necessitated the second phase.

The second phase of this project employed a survey to solicit opinions regarding the effects of APLs from current and former military personnel who have had experience with them, primarily in a non-training situation. Use of this survey proved to be a very valuable mechanism for obtaining assessments of APL effects from individuals who were affected by them.

The proposed worldwide ban on APLs is an emotionally charged issue that is currently the subject of heated debate in the international arena. For a discussion and review of the worldwide conditions involving landmines and current humanitarian efforts to ban them, a variety of sources are available (e.g., Arms Project of Human Rights Watch & Physicians for Human Rights, 1993; Cahill, 1995; Human Rights Watch Arms Project & Human Rights Watch/Africa, 1994; International Committee of the Red Cross, 1996; U.S. Department of State, 1993, 1994). **It is specifically emphasized that *this paper does not take a stand on whether or not APLs should or should not be banned!*** This report stems from President Clinton's September 17, 1997 announcement. Given his stated goal, this report aims to provide input regarding what is necessary to know about APLs in order to replicate their psychological effects.

## Literature Review

The first phase of this research consisted of a review of the open literature to uncover previous research that investigated the psychological effects of APLs and reveal what such research found.

### Operational Effects

A thorough treatment of the operational use and effectiveness of landmines is well beyond the scope - and was not the point - of this paper. Several sources address this issue. U.S. doctrine regarding mine warfare is detailed in *Field Manual 20-32 (FM 20-32)* (Department of the Army, 1998). Along with an extensive bibliography, Sloan (1986) discusses many aspects of mine warfare including mine and countermine warfare of recent times, tactical use of mines, types of mines, and mine technology. Mahoney (1996) provides an especially easy-to-read, yet succinct and thorough, discussion of land mine warfare and also offers an extensive bibliography. Although Mahoney's discussion is based on an earlier version of *FM 20-32* (Department of the Army, 1992) and doctrine stated in the new version (Department of the Army, 1998) is different, his discussion is still largely relevant. All references to *FM 20-32* in this report refer to the latest version.

Although a thorough discussion of land mine warfare is not attempted here, it is informative to provide a cursory summary in order to provide a context for discussion of the psychological effects. This discussion is divided into two parts: the military utility of landmines and their operational effectiveness. As used in this report, the phrase "military utility" refers to the role that APLs play in military operations according to U.S. doctrine; the phrase "operational effectiveness" refers to judgments of how effective they are in fulfilling that role. The primary source for ascertaining the military utility is U.S.

doctrine: *FM 20-32*. Sources for ascertaining operational effectiveness are varied, consisting of commentary in the literature and results of simulations of mine warfare.

**Military utility.** *FM 20-32* states that minefields are used to

- Produce a vulnerability on enemy maneuver that can be exploited by friendly forces.
  - Cause the enemy to piecemeal his forces.
  - Interfere with enemy command and control.
  - Inflict damage to enemy personnel and equipment.
  - Exploit the capabilities of other weapon systems by delaying enemy forces in an engagement area.
  - Protect friendly forces from enemy maneuver and infiltration.
- (Department of the Army, 1998, p. 2-1)

Mahoney (1996) elaborated on these uses in his examination of the role of land mines in countermobility doctrine, which focuses on the use of obstacles to delay, restrict, or stop enemy maneuver. He explained that mine warfare serves four primary purposes in countermobility operations: disruption of enemy formations and control, canalization of enemy forces, protection of friendly forces from enemy assault, and attrition of enemy personnel and equipment. Attrition of enemy personnel and equipment, Mahoney explained, is the most fundamental purpose of mine warfare in countermobility operations and it is this potential - or the enemy's fear of it - that allows mines to accomplish the other three tasks. Mahoney also explained that landmines accomplish destruction through both direct actions (i.e., the effects of a detonated mine) and indirect action (i.e., destruction caused by direct and indirect fire systems which are generally used in conjunction with mines).

Landmines accomplish their four countermobility tasks through minefields and nuisance mining (Mahoney, 1996). *FM 20-32* identifies four general types of minefields - protective, tactical, nuisance, and phony - and provides extensive details on all. A phony minefield is just what the name implies: a "minefield" containing no live mines. Its purpose, Mahoney explained, is to entice the enemy into wasting breaching assets and time on a useless target and, if used frequently, can cause complacency. *FM 20-32* reiterates this point when it notes that the success of a phony minefield depends on the enemy's state of mind. The *FM* explains that they are most successful when the enemy is "mine-conscious" and has already encountered mines and suffered the consequences. The *FM* also notes that fear of mines can quickly escalate into paranoia that can break the momentum of the enemy's attack. The fact that the presence of a mine does not need to be secret - as is the case with a marked minefield - is a testament to the powerful effect of mines. The further observation that mines can be effective even when only believed to exist - as in a phony minefield - gives further evidence of the powerful psychological effect of mines.

Nuisance minefields, which act as physical impediments to maneuver, are considered a form of tactical minefield (*FM 20-32*). Such minefields are designed to undermine an enemy's will by unexpectedly introducing danger into seemingly safe situations, thus making soldiers excessively cautious (Mahoney). In this role, Mahoney

noted that nuisance minefields serve their countermobility purpose primarily through a psychological effect.

Vinson (1998) identified three distinct functional features of landmines which, he asserted, any alternative must replicate in order to be an effective replacement. These three features are activated simultaneously when a mine explodes. In such an instance, the mine serves in an alerting or observing capability, indicating the potential presence of hostile forces in the area; it communicates this information, signaling to friendly troops the possible approach of the enemy; and, finally, it acts against or attacks this threat.

**Operational effectiveness.** The international movement to ban APLs has lead many people to comment on their operational effectiveness. Although the doctrinal utility of APLs is relatively objective and fairly straightforward, conclusions regarding their effectiveness at performing those tasks are not quite so clear. Opinions about the true usefulness of APLs are very mixed and quite polarized. Remember that a thorough review of the literature regarding the operational effectiveness of APLs is not attempted here. However, the literature discussed in this section provides a representative sample of the extensive commentaries available.

Two examples of high-profile public commentaries on the APL issue came from similar sources: open letters written to President Clinton by retired general officers, many of whom were high-ranking military leaders. The first letter was presented on April 3, 1996 (Jones et al., 1996) and urged the President to support a ban on the production, stockpiling, sale, and use of APLs. According to the 15 former military leaders who signed the letter, APLs are "not essential" given "the wide range of weaponry available to military forces today." Thus, they asserted that "banning them would not undermine the military effectiveness or safety of our forces, nor those of other nations." They noted that the proposed band would not affect antitank (AT) mines or command-detonated weapons such as Claymores.

The second letter - signed by 24 military leaders (all but one retired) - was dated July 21, 1997 (Barrow et al., 1997). The signatories urged President Clinton to "resist *all* efforts to impose a moratorium on the future use of self-destructing anti-personnel landmines by combat forces of the United States." Focusing on the defensive use of non-self-destructing APLs in Korea and on self-destructing APLs elsewhere, these letter-writers attested that, in their experience, "such responsible use of APLs is not only consistent with the Nation's humanitarian responsibilities; it is indispensable to the safety of our troops in many combat and peacekeeping situations." They noted that "studies suggest that U.S./allied casualties may be increased by as much as 35% if self-destructing mines are unavailable -- particularly in the 'halting phase' of operations against aggressors."

Although the first letter focused on all APLs, whereas the second focused on self-destructing APLs (and non-self-destructing APLs only in Korea), overall, these two letters parallel the myriad comments in the literature: opinions at one extreme insist that, essentially, APLs are not needed; whereas opinions at the other extreme insist that, essentially, they are indispensable. Although commentaries vary within the two polar extremes, few take a middle-of-the-road opinion.

The points repeatedly raised throughout the literature on the landmine issue follow several basic themes. In their most basic usage, landmines evoke fear that slows

soldiers down. The resulting fear and possibly decreased speed, then, lead to several benefits to the force using them. APLs were initially developed to keep enemy soldiers from tampering, removing, and disarming AT mines. In line with their doctrinal usage, much of their operational effectiveness stems from their ability to cause delay, disrupt and hinder enemy movement, and deny the enemy ground. These abilities can be used for several purposes, such as protection of friendly assets, and are central to the argument that APLs are necessary in Korea: to prevent or, at least, buy time for reinforcements to arrive in the event of a mass infantry attack of Seoul by the North Koreans. It should be noted, however, that this conclusion is not universally accepted. For example, LTG (Ret.) Robert Gard disagreed that APLs are essential for the defense of South Korea and suggested that mines in such a theater may actually interfere with mobility of U.S. troops should the North Koreans invade (Adde, 1998).

APLs can also be used to direct enemy troops toward an area where the defender is best able to defeat them - in other words, they help "shape the battlefield." Employed in this manner with other weapon systems such as direct or indirect fire, APLs have a "synergistic" effect. According to Sloan (1986), they can enhance the effectiveness of a defending weapon system by a factor of between 1.5 and 2.5. Klemencic (1998) reported that the DOD considers them to be militarily significant weapons. Johnson (1995) presented an historical review of the effectiveness of APLs and concluded that historical examples demonstrate that they do, indeed, perform their intended military purposes.

Not only are APLs multi-functional, they are also resource-effective. APLs are cheap (often between \$3 and \$30, according to Bier, Grzyb, & Stevens, 1998) and simple. As a result, they are plentiful and can be used in large quantities. Thus, they can be an inexpensive yet effective substitute for personnel - a force multiplier - in defensive scenarios, especially when used against a numerically superior force. This economy of force function of APLs is frequently hailed as one of their most critical operational roles.

Because of their low cost, they are often referred to as "the poor man's weapon" and are a weapon of choice for the less technologically advanced, lightly-armed insurgent. In this capacity, APLs are very effective in low-intensity conflict, the most prevalent form of warfare and the form predicted most likely to occur in the future (Carroll, 1988; Schneck, Visser, & Leigh, 1993a). Furthermore, because advances in landmines have outpaced advances in countermining, the use of APLs allows the least technically developed combatant to effectively compete with even the most technically sophisticated adversary. In fact, May (1998) suggested that a radical improvement in countermine technology could decrease the perception of APL effectiveness.

Unfortunately, humanitarian issues have arisen because APLs - specifically, those APLs which do not self-destruct or self-deactivate - work too well. Not only are such so-called "dumb" APLs effective, untiring substitutes for real soldiers in combat, they are effective and long-lasting - typically permanent - sentinels once the war or hostilities end. (Note that this is not the case for so-called "smart" APLs which self-destruct or self-deactivate after some amount of time and, hence, have a limited lifetime. Further note that current U.S. doctrine as stated in *FM 20-32* allows for the use of non-self-destructing APLs for only [1] defense of the Korean demilitarized zone (DMZ) and [2] training. Except for those two situations, the U.S. uses self-destructing or self-deactivating APLs.) Furthermore, landmines cannot discriminate military from civilian or friend from foe and, as a result, can contribute to fratricide. It has been estimated that landmines were

responsible for about 1 in 3 U.S. casualties in the Vietnam War, 1 in 10 in the Gulf War, and nearly every casualty suffered by U.S. peacekeepers in the Balkans (Skolnick, 1997). Furthermore, Leahy (1997) stated that every American casualty from enemy causes in Bosnia came from a mine. With the fear they evoke, they are also useful in deliberate acts of terrorism. Strada (1996) noted that mines have been used in increasingly cunning manners: to deprive access to water sources, wood, fuel, pathways, and burial grounds. Such negative aspects aside, the assertion is often made that landmines save the lives of U.S. soldiers in battle.

These basic points - or criticisms thereof - are combined in various ways to construct most opinions regarding the effectiveness of APLs. Despite the strong opinions on both sides, only a handful of critical analyses appear to have been performed. Many of the statements about the operational effectiveness of APLs are based on conclusions that battle or situation outcomes occurred because of APL use. Although assessment of the accuracy of such conclusions is beyond the scope of this paper, it is important to remember that, in taking a critical approach, it must be considered that other factors besides APLs - perhaps not immediately obvious - may have also come into play, possibly in very complicated ways. From a strictly scientific approach, cause-and-effect can only be concluded if the potential cause has been isolated from all other possible factors. Clearly, it is not possible to analyze most military situations in this manner. In the real world, a battle or situation occurs and the effects of APLs are inferred. Another - but potentially more objective - alternative is the analysis of computer-generated warfighting simulations.

At the time this research was conducted, five analyses of the operational effectiveness of APLs were uncovered: 3 primarily historical analyses (Mahoney, 1996; Klemencic, 1998; International Committee of the Red Cross, 1996), a series of simulated battles conducted by the Institute for Defense Analysis (IDA) (Biddle, Klare, & Rosenfeld, 1994; Biddle, Klare, Oelrich, & Wallis, 1996), and a study of APL alternatives sponsored by the Office of the Secretary of Defense / Acquisition & Technology (Greenwalt & Magnoli, 1997). As this report went to print, additional recent analyses of the use and operational effectiveness of APLs from a historical perspective were uncovered (e.g., Funk, 1998; Supplee, 1998). Because this research does not purport to be a thorough examination of the operational effectiveness of APLs, those studies are not reviewed here. Nevertheless, the five analyses presented below representatively illustrate the bottom line: there is no unanimous conclusion within the entirety of the literature regarding the operational effectiveness of APLs.

Mahoney (1996) used the Second Battle of El Alamein to assess effectiveness of mine warfare without APLs. He concluded that a ban on conventional (i.e., hand-emplaced and requiring manual arming) APLs would pose no significant threat to the Army's ability to perform countermobility operations. The implication that the Army can successfully do without conventional APLs appears to call into question their operational effectiveness. Others have reached this same conclusion. Klemencic's (1998) analysis of recent computer simulations, historical examples, and comments by military professionals led him to conclude that APLs may not be as effective as the DOD believes. The International Committee of the Red Cross (ICRC) (1996) reached a similar conclusion after examining the actual use and effectiveness of APLs in 26 conflicts since 1940. Although the ICRC acknowledged the military value of anti-tank mines, it



concluded that the military value of APLs is questionable and that historical examples do not support the claim that APLs are indispensable.

The remaining two studies employed computer simulations to assess the operational effectiveness of APLs. The IDA (Biddle et al., 1994) used the Janus combat simulation model to conduct a series of simulated battles in which battles were conducted with APLs, AT mines, and various possible mine substitutes and the subsequent effects observed. These simulations considered U.S. tactical offense and defense, U.S. and enemy mine use, and several potential landmine substitutes. This series of simulations resulted in three principal summary observations. The first finding supported the argument that – at least in high intensity mechanized land warfare – landmines provide economy of force, canalize attacks, increase an attacker's losses, and reduce a defender's losses. The second finding, however, was that the magnitude and, possibly, the direction of the effect of landmines in terms of those four capabilities are strongly related to both the nature of the fighting (defense vs. offense) and the type of landmines considered (anti-personnel vs. anti-tank). Finally, the third observation was that increased artillery fire or non-explosive obstacles may not be the most efficient substitutes for landmines. The IDA conducted additional simulations to investigate the effects of different levels of compliance to an APL ban (Biddle et al, 1996). Overall, the collection of IDA studies suggested that the operational effectiveness of APLs depends on the circumstances in which they are used. Although, a critical analysis of the results of the IDA studies is well beyond the scope and intent of this paper, it should be noted that the IDA studies have been criticized as flawed by several sources (e.g., R.J. Greenwalt, personal communication, February 16, 1999; Supplee, 1998).

The fifth study (Greenwalt & Magnoli, 1997), similar to the IDA studies, used standard combat simulations (Janus, CASTFOREM, and the Joint Conflict Model) in a two-phase study to establish the battlefield contribution of current APLs (Phase I) and assess the ability of alternatives to provide adequate replacements (Phase II). Like the IDA studies, these studies compared the results of a battle with APLs to the results of the same battle without, as well as to the same battle with each proposed APL alternative. Simulated missions were to provide close protection, protect AT mines, protect against infiltration, and disrupt operations. Scenarios consisted of a defense mission, an offense mission, and an early entry mission. Although the investigators noted that it was impossible to accurately model the psychological effects of a minefield, they asserted that the chosen methods of modeling casualties, delay, and change in movement rates provided a conservative equivalency. Phase I results suggested that the most important battlefield contribution of APLs was to reduce friendly force casualties and the second most important contribution was to increase the effectiveness of other weapons (i.e., AT minefields, artillery, and direct fire). Other contributions were to increase enemy force casualties, reduce battle tempo, and allow the friendly force to win. Phase II examined conceptual alternative concepts. Although the investigators were able to identify the two best alternative concepts of the four, they cautiously noted that the inability to adequately model fear and psychological factors may have made the alternatives look overly effective in comparison to APLs.

With opinions regarding the operational effectiveness of APLs running the entire spectrum, any type of critical analysis can shed some much-needed light on the matter. The analyses presented here, however, suggest that it is difficult to arrive at a simple



conclusion regarding the operational effectiveness of APLs; instead, the efficacy of APLs appears to be a complicated function of many factors.

### **Physiological Effects**

Much of the fear induced by APL's may be a result of the injuries they inflict. Because of this, it is instructive to provide an overview of the physiological effects of APLs. As with the operational effects, a thorough treatment of the physiological effects is beyond the scope of this paper.

As detailed by Schneck, Visser, and Leigh (1993b), there are three types of APLs: fragmentation, blast, and chemical. Fragmentation mines are further divided into bounding, directional, and simple fragmentation types. Technical details of the different mines are not presented here (detailed technical information on common mines can be found in U.S. Department of State, 1993). It is important to note the different types of APLs because they cause injuries in different ways and lead to different types of injuries. Blast mines - which are usually pressure-activated - send a small explosive force directly upward. Fragmentation mines - which are usually activated by a trip wire - either send shrapnel in a general (simple) or specific (directional) direction or eject a canister a few feet out of the ground which then explodes in the air (bounding). (Chemical mines are not the focus of this report.) With a blast mine, the injury comes from the explosion itself; whereas with a fragmentation mine, the injuries come from shrapnel and flying debris (Strada, 1996). Because the damage done by a blast mine is related in part to the weight of the person who activates it, larger people tend to suffer less severe injuries (Human Rights Watch Arms Project & Human Rights Watch/Africa, 1994). Furthermore, more women die from landmine injuries than do men and, overall, women tend to be more badly injured (Human Rights Watch Arms Project & Human Rights Watch/Africa, 1994).

Although mines can inflict a variety of injuries, Strada (1996) identified and described four general patterns of injuries: Patterns A, B, C, and D. Pattern A injuries - typically caused by small blast mines - usually amputate the foot or leg although sometimes only part of the foot is blown off. Usually, however, these injuries occur below the knee and are limited to only one leg. Pattern B injuries are usually caused by larger blast mines and involve traumatic amputation in which the lower part of a leg or the entire lower leg is blown off. These injuries often involve wounds to the thigh, genitals, buttocks, and opposite leg, as well as to the abdomen or chest. Pattern C injuries are caused by the Russian PFM-1 "butterfly" mine and other similar-type mines. Because this mine is only activated after it has sustained a cumulative amount of pressure and is usually being held when it detonates, the resulting injuries typically amputate several fingers or one or both hands. Injuries to the chest, face, and eyes may also occur. The final pattern of injuries - Pattern D - are caused by fragmentation mines and involve injuries throughout the body or, usually, instant death. The ICRC (1995) has a similar system for classifying injuries: Pattern I correspond to Strada's Patterns A and B, Pattern II correspond to Strada's Pattern D, and Pattern III correspond to Strada's Pattern C.

Because vital structures are often directly damaged and the extensive wounds may cause hemorrhagic shock, individuals who are injured by mines are typically in critical condition (Strada, 1996). Furthermore, because explosion of the mine can propel dirt,

grass, pieces of clothing, and metal and plastic fragments into the victim, mine wounds are dirty and contaminated and risk of infection is a very high. Thus, mine injuries require rapid evacuation and early treatment. Stover, Keller, Cobey, and Sopheap (1994) reported that 6 hours between injury and treatment is the maximum safest delay.

Immediately following injury, surgical cleansing of the wound is the most critical task (Strada, 1996). Blood is also needed and Stover, Kelley, Cobey, and Sopheap (1994) pointed out that, compared to injuries from other munitions, mine blast injuries often require twice as much blood. In addition to large amounts of blood, individuals who survive the initial blast require antibiotics and extended hospital stays. Often, injuries are so extensive that amputation of the affected area may be the only option. In this case, multiple operations are typically required to save the victim and provide a stump capable of sustaining an artificial limb (O'Brien, 1994). Amputees then require physical therapy, prosthetic devices and, possibly, therapy to cope with their trauma. Thus, for individuals who survive a mine blast, rehabilitation, prosthetics, and long-term care may all be a necessary element of their remaining life.

Nelson (1996) reported an estimate that treatment of one wounded soldier may require up to 13 people, several hours of operating room time, and a large amount of supplies. Clearly, injuries resulting from APLs are typically grisly as well as time, equipment, and labor intensive.

### **Psychological Effects**

General Patton observed that, "The effect of mines is largely mental" (Patton, 1975, p. 406) and, indeed, the literature is peppered with references to the "psychological effects" of landmines. However, it appears that no study has attempted to specifically measure or document the effects of enemy APLs on soldiers. The literature, however, did provide some tangential insights.

It is intuitively obvious that APLs induce fear. There are, however, many other sources of fear on the battlefield other than landmines. One such source is unexploded ordnance (UXO) - any explosive munitions which "have been fired, projected, dropped, or placed in such a way that they could become armed and go off" (Department of the Army, 1994). Because of its nature, UXO poses hazards very similar to landmines. However, Bier, Grzyb, and Stevens (1998) noted that there are differences in dealing with the two. Primarily, because UXOs are usually on the surface of the ground, rather than buried, they are significantly easier to detect, often by simple visual inspection alone. Furthermore, UXO casings are metal, which also make them easier to detect with conventional detection equipment.

Holmes (1985) discussed the occurrence of fear in battle and noted that mines have come to be an important fear-producing agent. He pointed out that a central aspect of fear of a particular weapon is the soldiers' perception of their ability to do something about it. Whereas aimed rifle fire is a direct, personal threat controlled by another individual, mines are not. Mines are an impersonal, inhuman threat that can strike at any time and without warning (Holmes). Furthermore, if a unit is in an area where APLs are known or believed to be present, the fear induced is likely to be constant and Kirkland, Halverson, and Bliese (1996) noted that continuous fear can be a combat stressor.

A repeated theme in the literature is that part of the fear produced by APLs is a result of the type of injuries they cause, given that mines are designed primarily to maim rather than kill. Although the death of a comrade is a troublesome event (Kirkland, Halverson, & Bliese, 1996), gruesome maiming of comrades is far more operationally effective from the enemy's viewpoint. Consider the result if a soldier steps on a mine and is injured. Not only are other soldiers forced to witness and listen to the distress of one of their own, but the possible presence of additional mines prevents them from rendering immediate aid. When the wounded soldier is finally reached, the nature of the injuries necessitates immediate direct contact to clean the wound and apply tourniquets. Recalling the four patterns, it is easy to envision that any injuries are, at best, very bloody and, at worse, very grisly. Furthermore, in the case of a blast mine, the blast force may propel the soldier into the air and onto another mine, perhaps pushing nearby soldiers onto mines as well. Alternatively, in the case of a fragmentation mine, flying shrapnel and debris may injure a number of soldiers. Any resulting scene is likely to be horrible for both victims and bystanders. Not surprisingly, APL injuries are a drain not only on resources but also morale. Furthermore, Boulden (1997) discussed the increased trauma and sense of tension following an accident during demining operations in Mozambique. Similar increases in anxiety are certainly likely for soldiers who have to return to the battlefield after a comrade is injured.

The first of, apparently, the only two commentaries in the literature which focused specifically on the psychological effects of mines was a gathering of reflections on mines as used at Alamein from a psychological standpoint (Lambert, 1952). Lambert made several important points. He discussed the effectiveness of simply marking a field as a minefield (regardless of whether or not it contained actual live mines). He also discussed the concept of "mine consciousness" and noted how it results in extreme slowness and caution and meticulous checking for mines in all possible locations. Furthermore, Lambert noted that there is something "faintly derogatory" about being a mine victim compared to being injured or killed in war by some other means. He also noted that, because of the variety of mine designs, the mine designer should always be able to, in essence, stay one step ahead of countermine capabilities. Finally, Lambert briefly discussed the consideration of "National Characteristics," questioning what the effects would be on an enemy who would ignore mines and simply accept casualties. To this end, he noted that APLs will not stop a fanatical or determined enemy.

The second commentary to specifically address the psychological effects of mines discussed the psychology of naval mine warfare (Greer and Bartholomew, 1986). As with landmines, Greer and Bartholomew noted that the most effective use of minefields is to control enemy forces, specifically by delaying forces or forcing them to divert from or forego their intended route. They asserted that the enemy's perception of the threat of mines is the primary mechanism through which minefields achieve their goal. Greer and Bartholomew pointed out that the fact that mines can cause serious damage makes their threat credible, but that a minefield's real effect comes from an exaggerated fear of the unknown. They asserted that the psychological effect of a minefield results from two aspects: inability to know the true threat and the risk of dire consequences associated with an underrated threat.

Greer and Bartholomew referred to several psychological studies to surmise the psychological effect of mines. They pointed to research which demonstrated that

decision makers tend to exaggerate the likelihood of relatively more serious consequences. Furthermore, they predicted that when there is no opportunity to determine the actual threat posed by a minefield, any danger clues whatsoever are likely to magnify the perception of the threat, forcing the decision maker into "all-or-none" thinking in which the minefield is categorized as either an unacceptably high or acceptably low risk. From historical evidence, they noted that the former occurs more often. Thus, any minefield is likely to be viewed as a serious danger.

Additionally, Greer and Bartholomew pointed out that minefields cannot be engaged or directly countered as can conventional enemy forces, thus eliminating the satisfaction of "fighting back." They refer to studies on psychological stress which suggest that the act of fighting back releases stress and, thus, assert that minefields cause a buildup of tension, rather than allowing a release of tension as when engaging an enemy.

Subject matter experts at the U.S. Army Engineer School who were contacted during the course of this research supported the points raised above and provided additional insights as to the psychological effect of landmines. E. Mazion (personal communication, July 16, 1998) linked the fear caused by landmines to the ideas that they cannot be seen and that they involve surprise.

S.J. Smith (personal communication, July 6, 1998) provided additional insights. He noted that mines - both anti-tank and anti-personnel - cause "an automatic increase in anxiety" and are "the most dreaded objects on the battlefield." Because they involve no noise to warn the soldier, he explained that they are worse than gunfire and artillery. Furthermore, because of the way they injure soldiers, he said they are "hated worse than death."

Smith raised some issues related to the use of APL alternatives. He expressed the concern that soldiers will not fear non-lethal alternatives the way they fear lethal APLs and that non-lethal alternatives will not cause delay as APLs are intended to. The resultant loss of delay, he explained, would defeat the goal of mine use: to stop the enemy long enough so that artillery and direct fire can be used, rather than to cause casualties. Without the ability to delay or stop the enemy, there is no way to get into their decision cycle and shape the battlefield to support a particular course of action (Smith).

Smith also suggested that soldiers may actually volunteer to trigger non-lethal APL alternatives because it might take them out of the battle. He noted that this may be especially true in situations where the rules of engagement do not allow freefire, such as Operations Other Than War, which is expected to be the most likely type of future situation. Furthermore, Smith noted that if APL alternatives involve some sort of sensors in order to discriminate combatants from noncombatants, enemy troops might simply masquerade as noncombatants in order to gain access to the mines and disarm or destroy them.

M.K. Gullick (personal communication, August 18, 1998) provided some final insights. He proposed that the level of psychological impact that mines have on a soldier is a function of several conditions: the soldier's personal discipline and disposition, the soldier's level of training and expertise with APLs, the leadership exerted on the soldier, and the remaining sum of battlefield conditions. In terms of personal discipline and disposition, Gullick proposed that highly disciplined soldiers are more likely to control their fears of APLs and focus on the task of neutralizing or clearing them. He predicted

that "a young conscript, hastily indoctrinated and thrown into battle, is less likely to approach APL with the same level of control as a professional soldier that has a more practiced personal discipline." This ties into the soldier's degree of training and expertise. Gullick noted that minefield breaching requires a highly skilled force conducting a synchronized effort. Thus, soldiers who are well trained in obstacle breaching have much more confidence in both themselves and the chain of command's ability to properly carry out the breach (Gullick). Thirdly, Gullick explained that leadership style varies greatly among armies and that "a soldier with a pistol to the back of his head is far more likely to walk through the minefield than a soldier without a pistol to his head." He added that, should a soldier be forced to walk through a minefield without proper breaching techniques, the mines are not delaying the force as much as they are simply killing them. Lastly, Gullick referred to the sum of the battlefield conditions. He pointed out that, at one extreme, the battle may be so intense that APLs have little psychological effect and, at the other extreme, the battle may be so sporadic that APLs are the greatest threat to the soldier. The key issue is what the soldiers perceive as the greatest threats to their lives at any given instant (Gullick). If, for example, artillery is landing all around and soldiers are being fixed by machine gun fire, he predicted that they will try to get out of the area regardless of landmines. Alternatively, if the enemy has sporadic or ineffective artillery fires and is incapable of fixing soldiers consistently with direct fires, he predicted that soldiers will breach the mines quite deliberately.

As testament to the effect APLs have on soldiers, Gullick (personal communication, August 21, 1998) relayed a personal incident which occurred when he was running a battalion-wide training event in Korea. Each of 27 squads was tasked with clearing a lane about 200 yards long through the minefield. All of the mines in the minefield were buried, making visible identification difficult, but all of the "mines" were inert. The squads had to move slowly through the lane, using their metal detectors, mark the mines as they were found, and then place an inert explosive charge next to them to "destroy" the mine. Although the squads varied in their clearance times, the mission took about 75 minutes on average. One squad, however, took 3 hours. Gullick was surprised at this squad's performance because their performance in all other aspects were excellent and he knew that the troops were knowledgeable about their duties and were well trained. Gullick also noted that they had "marked" and "cleared" many locations that did not actually contain mines. Furthermore, he noted that the troops were very cautious about where they moved in the breach lane and stayed well away from marked mines. After the exercise, Gullick discussed the squad's performance with the squad leader. He learned that the squad's leadership had some very young privates in the squad and wanted them to take the training very seriously. To accomplish this, they decided to tell the junior squad members that the minefield contained live and fully armed mines. This incident proved to Gullick just how dramatically APLs can slow soldiers down.

Gullick expressed his opinion that the real impact of the psychological effect of APLs is that they slow movement through an area. He noted that they may make leaders bypass minefields, thus causing a change in the maneuver plan, or they may make them completely stop movement. He explained that this is different from the effects of other types of weapons. Artillery causes soldiers on the attack to accelerate movement in order to avoid further artillery hits and direct fire forces leaders to maneuver their forces "into a



positional advantage on the enemy's main weapon systems," which implies a tendency to move urgently (Gullick). Landmines, however, Gullick noted, cause soldiers to fear their next step. Hence, he explained, combined with artillery and direct fire, landmines put soldiers in a "Catch 22": if they stay and deal with the mines, they increase their exposure to the other fires, but if they decide to rapidly exit the area and move less cautiously, they are forced to accept the risk that "the next step may be the last." Gullick added that all of the soldiers – both leaders and subordinates – go through this "mental exercise." As a result, it has as a "multiplying effect" among them that may slow the enemy's decision making process - if not their actual movement - while considering the options.

With regard to APL alternatives, Gullick (personal communication, August 18, 1998) offered two observations. First, he noted that one of the reasons APLs are so effective is that every inch of ground must be cleared in a path to counter them. In contrast, he reported seeing some proposed APL alternatives that are "so large that they make identification of the APL easy" and he warned that any sufficient APL alternative must be resistant to easy identification by foot soldiers. Second, Gullick explained that anti-handling devices (AHDs) on AT mines do not provide the same level of fear as APLs. AHDs, he noted, merely prevent an AT mine from being removed from the ground and do nothing to prevent unrestricted movement in the minefield. In contrast, APLs do not allow freedom of movement around the AT mines - soldiers are forced to deal first with the APLs, then with the AT mines (Gullick).

## **Method**

The second phase of this project was an exploratory investigation into the effects of APLs on individuals who had experience with them, primarily in a non-training situation.

### **Participants**

The population of interest consisted of current or former military personnel who have been deployed outside of the continental U.S. in an area where anti-personnel landmines were present. To obtain a sample from this population, a survey was distributed via email to three groups of individuals. The first group consisted of all military and civilian personnel at the United States Military Academy (i.e., everyone except cadets). The second group consisted of all attendees of the 1998 Mines, Countermine & Demolitions Symposium and Exhibition. The third group consisted of individuals knowledgeable in the area of APLs and mine warfare. In addition to these three groups, some survey recipients forwarded the survey to other current or former military personnel. Because of this, the survey also reached additional individuals at various places around the world.

The survey was sent to 3315 individuals in the first group, successfully reached 143 individuals in the second group, and was sent to approximately 10 individuals in the third group. With the four distribution methods, it is unclear exactly how many individuals the survey reached, but it was sent to at least 3468 individuals. Of these, it is



unknown how many of the recipients had experience with APLs in a non-training situation and, thus, met the desired criteria for completion of the survey. Ninety-nine individuals responded.

### **Instrument**

The survey used in this study appears in Appendix 1. The first part gathered data on current rank, current branch, and information regarding the respondent's experience with APLs (the situation/conflict and rank and branch at the time). The second part consisted of two free-response questions. The first question addressed the respondent's perception of the psychological effects of APLs; the second addressed the perception of their operational effects in the situation/conflict.

### **Analysis**

Given the first-of-its-kind and exploratory nature of this project, it was unknown *a priori* what to expect from distribution of the survey. It was unknown how many individuals would respond or what they would say. Thus, no formal inferential statistical analyses were planned or carried out. Analysis consisted of summarizing the responses.

## **Results**

### **Demographics**

The current ranks for the 99 respondents and their associated frequencies appear in Table 1 (next page). Because of an unequal distribution across ranks and to maintain anonymity of the respondents, ranks are presented in four groups: "Junior Enlisted" consists of enlisted soldiers with a rank of SGT or below (e.g., PV, PV2, PFC, CPL, and SGT), "Senior Enlisted" consists of enlisted soldiers above the rank of SGT (e.g., SSG, SFC, MSG, 1SG, SGM, CSM, and SMA), "Junior Officer" consists of officers with a rank of MAJ or below (e.g., 2LT, 1LT, CPT, and MAJ), and "Senior Officer" consists of officers above the rank of MAJ (e.g., LTC, COL, BG, MG, LTG, and GEN). The current branches for the 99 respondents and their associated frequencies appear in Table 2 (next page). To maintain anonymity of respondents, some branches have been combined in the table listing.

Table 1  
Frequencies for current ranks of respondents.

<i>Rank</i>	<i>Frequency</i>	<i>Percent</i>
not indicated	2	2.0
Civilian	4	4.0
Junior Enlisted	2	2.0
Senior Enlisted	9	9.1
Retired Senior Enlisted	3	3.0
Junior Officer	42	42.4
Senior Officer	20	20.2
Retired Junior Officer	1	1.0
Retired Senior Officer	15	15.2
Retired Officer <sup>a</sup>	1	1.0
<b>total</b>	99	100

Note. <sup>a</sup>This respondent did not indicate the specific retired officer rank.

Table 2  
Frequencies for current branches of respondents.

<i>Branch</i>	<i>Frequency</i>	<i>Percent</i>
not indicated	6	6.0
Civilian & U.S. Marine Corps	5	5.1
Retired	20	20.2
Civil Affairs	2	2.0
Professor USMA	3	3.0
Air Defense Artillery, Field Artillery, & Special Forces	4	4.0
Armor	8	8.1
Aviation	3	3.0
Engineer	17	17.2
Infantry	13	13.1
Chemical	3	3.0
Military Intelligence	2	2.0
Military Police	4	4.0
Ordnance	4	4.0
Quartermaster, Transportation, Medical	5	5.1
<b>total</b>	99	100

Demographic data were also gathered about the participants' experiences with APLs or the threat of APLs. The respondents' ranks at the time of their experience(s) and their associated frequencies appear in Table 3 (next page). Some respondents had more than one experience with APLs at different ranks, thus the total number of ranks

appearing in the table exceeds the number of respondents. Because of this, a percentage column does not appear. As with the current rank data, ranks are presented in four groups.

Table 3  
Frequencies for ranks of respondents at the time of their  
APL experience.

Rank	Frequency
not indicated	1
Civilian	1
Enlisted <sup>a</sup>	2
Junior Enlisted	9
Senior Enlisted	8
Junior Officer	77
Senior Officer	7

Note. <sup>a</sup>These respondents did not indicate the specific enlisted rank.

The branches for the respondents at the time of their experience(s) and their associated frequencies appear in Table 4 (next page). As with the ranks, some respondents had more than one experience with APLs while in different branches, thus the total number of branches appearing in the table exceeds the number of respondents. Because of this, a percentage column does not appear.

Data were also gathered about the situation/conflict during which the respondents encountered APLs. Associated frequencies for these data appear in Table 5 (page 18). For ease of display, the situations/conflicts are grouped according to geographical region. Because some respondents had multiple APL experiences in different situations/conflicts, the total number of situations/conflicts appearing in the table exceeds the number of respondents and a percentage column does not appear.

Table 4

Frequencies for branches of respondents at the time of their APL experience.

Branch	Frequency
Civilian	1
U.S. Marine Corps	1
not indicated	6
Civil Affairs	2
Infantry	22
Air Defense Artillery	2
Field Artillery	4
Armor	16
Aviation	4
Engineer	20
Special Forces	4
Chemical	3
Military Intelligence	2
Military Police	5
Medical	2
Ordnance	7
Quartermaster	2
Transportation	1

Table 5

Frequencies for the situation/conflict during which the respondents encountered APLs.

Region of Situation/Conflict	Frequency
not indicated	1
training	5
<b>Africa</b>	
Egypt	1
Sinai	5
Somalia	4
Operation Restore Hope (Somalia)	2
<b>Latin America</b>	
Cuba	1
Operation Sea Signal (Cuba)	1
El Salvador	2
Haiti	1
Operation Just Cause (Panama)	2
<b>East Asia/Pacific</b>	
Cambodia	1
Korea	10
Korean DMZ	3
Laos	1
Vietnam	26
<b>Europe</b>	
Bosnia	12
Gunja-Brcko Bridge Area (Croatia/Bosnia)	1
Operation Joint Endeavor (Croatia)	3
Georgia	1
Germany	6
Operation Provide Comfort (Turkey)	3
<b>Near East</b>	
Iraq	4
Operation Desert Storm (Iraq)	33
Israel	1
Jordan	1
Kuwait	1
Operation Positive Force (Kuwait)	1
Operation Vigilant Warrior (Kuwait)	1
Lebanon	1
Saudi Arabia	1
Operation Desert Shield (Saudi Arabia)	10
Yemen	1

The geographical groupings used in Table 5 are the same as those used by the U.S. Department of State (1993) to illustrate reported landmine incidents around the world. Comparison of Table 5 to the U.S. Department of State figures indicates that the respondents in this study have had at least some experiences with APLs in most of the world's regions that have reported landmine incidents. The only U.S. Department of State region not represented by the sample in this study is South Asia (i.e., Afghanistan, India, Pakistan, and Sri Lanka).

### **Psychological Effects**

The first survey question addressed the respondent's perception of the psychological effects of APLs. Respondents provided a variety of insights about the psychological effects and several key themes emerged. These key themes are discussed in the following subsections. Incorporated into each subsection is at least one quote from a respondent. The situation(s)/conflict(s) in which the individual encountered APLs or the threat thereof and the rank(s) and branch(s) (if provided by the participant) at that time are indicated. Ranks are presented in the same four groups used in the previous section.

All of the information presented in this section represents comments made or information provided by respondents. In some cases, this information is provided in narrative format to aid readability. Phrases in quotes represent exact phrasing by participants.

#### **Little/no psychological effect.**

*... the bottom line was we just took chances. We still continued to do our mission and just did it under conditions of fear and stress. Since this was nothing new to war, I don't think we gave it any extra consideration than caution required.*

*- Junior Officer, Armor  
Desert Storm*

Some respondents indicated that they and/or others were not very concerned or affected by the presence or believed presence of mines in the particular situation/conflict. They were regarded simply as "just one more thing that could kill" or a "nuisance they had learned to live with." They knew they were living in a "combat zone" and that there were many additional hazards. Some were surprised that APLs were there or surprised at the quantities of mines involved. One respondent simply tried not to think about it and focused instead on just doing the mission as "safely and smartly" as possible. Others simply indicated that they had a job to do and they did it. One respondent - who relayed an incident of stepping over a trip wire - did not recall that the incident had "any great psychological effect" except that the respondent "can remember it still very clearly." One respondent noted that "when one person is in the minefield, there is a little peer pressure not to be the chicken."

Respondents attributed their lack of concern to factors such as having a good understanding of where the mines were and how they could protect themselves, having



confidence in the Army's ability to find and mark minefields, having clearly marked routes that allowed safe passage, or knowing that the mines were old and that many would be inoperative due to environmental conditions. Other respondents attributed their lack of concern to factors related to their type of duties noting, for example, that they would have been affected if they had to move over land, if they were in a divisional unit, or if, as an aviator, they had to land in unfamiliar landing zones. One respondent worked with soldiers who had injuries from previous battles. Regarding them as "tremendous soldiers" who were examples that you could still be a "whole man and person" after suffering APL-type injuries gave the soldier comfort and helped to reduce the threat of APLs.

Mines were sometimes regarded as an equal or less threat compared to other dangers such as snipers, ambushes, chemical mines, or mortar attacks. Some Armor soldiers noted that APLs were not as much of a concern as AT mines and that they were afraid of AT mines.

Some soldiers were not afraid but felt that others were and a few expressed concern not for themselves but for others. According to them, other soldiers experienced reactions ranging from "unnerved" to "terrified of the possibility of stepping on mines." One respondent recalled that fellow soldiers never left base camp. Another noted that the only casualty within the platoon was a case of mine-induced combat stress and that the soldier had to be evacuated.

### **Fear.**

*Fear of the unknown is the emotion most described. Fear of being maimed. Mines are a tremendously effective psychological weapon in addition to their killing effectiveness -- they put extraordinary fear in otherwise good soldiers.*

*- Junior Officer, Armor  
Vietnam*

*... we came upon a portion of the minefield where the sand had shifted to reveal dozens of mines. The effect on my soldiers and I was immediate. I will never forget how some of the mines were completely visible while others were slightly exposed. Something about the uniformity of the spacing between the mines was unnerving. I had difficulty keeping my eyes off the mines and felt a tightness in my stomach. Radio transmissions took on a different tone - much more serious. From a psychological standpoint - this event "ratcheted" us to a new level.*

*- Junior Officer, Field Artillery  
Operation Desert Shield/Storm*

The majority of respondents indicated some type of psychological response to mines. The most often reported effect was some degree of fear. Respondents indicated various degrees of fear ranging from worry and apprehension to extraordinary fear and devastation. Some regarded them as the single greatest and likeliest threat to their safety - more so than direct enemy fire, in some cases - or felt that, if they were killed, it would

be because of mines or chemicals. One respondent explained that the response to mines is "paranoia, hypersensitivity, and overreaction until one becomes dysfunctional (usually after about 180 days in actual combat)." Some recalled thinking a lot or constantly about mines whereas others linked the fear specifically to going into uncleared areas for the first time or moving off of cleared paths. As a result of fear, soldiers sometimes undertook missions with reluctance. In some cases, the callousness or lack of caution and concern of others made respondents nervous and they felt that others did not fully understand the threat or take it seriously.

Some respondents described how they dealt with the fear of mines. One mentally evaluated what might happen if their vehicle hit a mine and reasoned that they would most likely survive and "left it at that." Another explained that the presence of APLs led to learning how to properly identify them and develop a plan if mines were encountered.

In an effort to explain their fear, one respondent explained that they only fear three things in life: spiders, chemical warfare, and mines. Another likened the effect of landmines to a fear of sharks:

*The threat of land mines was ever present once we crossed the berm at the beginning of the ground war and the nagging fear of them never left me until I crossed back south of the berm months later. It was very much the same feeling that I have when I am in salt water, I am dreadfully afraid of sharks and no amount of statistics, education or experience will allow me to relax and just enjoy the water. I scan the horizon for fins the entire time I am near the water, I shy away from deep water and arrange my activities on the beach to minimize my exposure. That is exactly the way the land mines affected me. Whenever I had a choice I would choose the activity or route that would minimize the exposure. When there was no choice, the mine threat was then accepted without fanfare and we "drove on." Whether I had the choice or not, mines were a conscious threat any time I was outside of any area I considered safe. I feel comfortable that the threat of mines never adversely influenced my duty performance or that of my unit that I am aware of. When the mission was to go into the water and swim out to where the big fish swim, I went. But several times I didn't like it very much.*

*- Junior Officer, Infantry  
Operation Desert Shield/Storm*

#### **Emotions other than fear.**

*Mines deny the soldier the use of the ground. We are taught that the ground is our friend. We dig fighting positions in it, we drop to the ground when fired upon by indirect or direct fire. Mines make a soldier's friend [a] dangerous enemy.*

*- Junior Officer, Infantry  
Operations Just Cause & Provide Comfort, northern Iraq, Korea*

*It was near the highway of death and we were going to stop all exiting traffic fleeing back to Iraq. The first time we noticed was a big shock, but then it sank in, we were in a mine field and the way out was [our] only concern. Two words fear and anger.*

*- Senior Enlisted  
Bosnia, Saudi Arabia*

Reactions other than fear were also noted. Some respondents simply said they had a "healthy respect" for mines and what they could do, accepting that they could be unpredictable and deadly. Other respondents specifically indicated a response other than fear such as caution, concern, or cautious respect. One of the respondents who recalled feeling caution rather than fear noted that the OPTEMPO was such that no one had to go into likely mined areas. Others indicated stronger emotions such as frustration, anger, or disgust. Some said the presence or believed presence of mines caused severe morale problems over time and demoralized and affected the attitude of troops. One respondent found seeing piles of cleared miles "chilling and sobering."

Some soldiers who had exposure to foreign soldiers noted that foreign soldiers dealt with mines differently - in some cases more recklessly or with overconfidence. One respondent - who observed the effects of mines on the people in Cambodia - noted that mine victims are treated poorly. Due to the society's belief in Buddhism, mine victims are believed to be "unlucky" and unable to regain their luck. As a result, most mine victims become beggars.

In some cases, the presence of mines impacted feelings toward the enemy or situation/conflict. One respondent reported that when the mines were pre-existing from some other military action, marking or removal of them was more "detached" for the soldiers. Some respondents reported harder feelings toward the enemy with increased time in mined areas and increased injuries or deaths. Another reported renewed respect for the enemy's ingenuity. Yet another found that enemy mine use impacted the attitude toward the conflict:

*The extensiveness of the minefields and the haphazardness of the emplacement and the lack of military purpose of many of them combined to shape my perception of the warring parties as unworthy of any American sacrifice for their future.*

*- Senior Officer, Armor  
Operation Joint Endeavor*

*Mines demoralize soldiers and incite them to take action against a cowardly enemy. Only a coward would use mines, is the thinking of most soldiers who have seen the casualties caused.*

*- Junior Officer, Armor  
Vietnam*

### Elements of the psychological effects.

*... when you start to multiply what's really there versus what could be there, what's really there is in 10% of the area and what could be there is in 100% of the area.*

*- Senior Officer, Infantry  
Somalia, Near East*

Although respondents were not specifically asked what caused their particular psychological response to the mines, some hinted at or directly identified the source.

A common theme was the uncertainty surrounding mines. Although APLs are sometimes plainly visible, such as in the desert when the wind blows the sand around, it is usually the case that they are hard to see, hard to detect, and soldiers have no idea when they will come in contact with one. Soldiers may know that there are mines in a general area, but they do not know exactly where they are. In some cases, soldiers marked fields but locals stole the signs. If a field was cleared, there was no way to know for certain if all of the mines had been destroyed. Adding to the uncertainty is the observation by one respondent that detection capability has lagged while mines have become harder to detect. Soldiers sometimes had little confidence that all mines were in properly marked areas. The environment sometimes played a role in the uncertainty as well. Thick, dense vegetation provides easy concealment of mines. In the desert, mines can migrate over time as the sand dunes shift and, as a result, known minefields can move miles over the course of several years and their arrangement can change. In support of the role of uncertainty, one respondent noted that in Berlin, where the location of the minefield was very well known, there was no psychological effect associated with the minefield. However, another respondent noted that, although soldiers who operate in a mined area become "savvy" about the likely places for mines to be, that still does not diminish the psychological impact.

*As an individual, I can tell you that nothing is more terrifying in the early stages of combat than mines, booby traps, and unexpected rockets or mortars exploding around you in the night. It is much easier to face a known enemy and his fire than the unknown enemy.*

*- Senior Officer, Armor  
Vietnam*

Tied to the idea of facing an unknown enemy is the issue of lack of control. Mines are not like a conventional enemy: soldiers cannot use supporting fires against them, there is no way to fight back against them, and there is no one to "get even with" after an encounter with one. One respondent noted that, in the presence of mines, the soldier must be "constantly aware that even if he is really good it might not be enough." The satisfaction of fighting back was indirectly noted by a few respondents who described positive feelings after successful mine encounters. That fighting back is an important component was suggested by an engineer who reported negative emotions such as anger, frustration, and a sense of failure when mines couldn't be found but accomplishment when they were successfully found. Another respondent who was sent

to collect minestrike information reported a sense of "being cool - flirting with danger and getting away with it" once the information had been successfully collected and the soldiers were safely away from the site.

Also involved is the perception of risk. One respondent noted that the less control of the risk individuals have, the less risk they are willing to accept. The respondent compared it to driving in that because people generally feel they have a fair amount of control over their driving, they tend to believe that, with proper driving, they can control the risk of a traffic accident. In support of this idea, some respondents noted that if soldiers were able to avoid possibly mined trails or were prohibited from going off of cleared routes, this often made them feel more comfortable about the threat.

In contrast to mines, soldiers have some control of the risk against, for example, artillery. Furthermore, soldiers are trained to respond different to mines and artillery. In the case of artillery, soldiers are taught to rapidly move to avoid enemy fire. In the case of mines, however, soldiers are taught to freeze in place. Not surprisingly, feelings of helplessness were also reported among participants.

*...when I was a LT my battalion S3 had been a military advisor in El Salvador. He [used] to tell the story about having been with an El Salvadoran unit that was in a far ambush along a road. The unit attempted [to] ... clear the ambush by maneuvering to the flank of the rebels. [They] ran into anti personnel mines that decimated the flanking unit. He said they never attempted to maneuver out of an ambush again. Instead, they would just sit tight and call for air support.*

*- Junior Officer, USMC  
Bosnia, Cuba*

*And a guy with a gun - you can kill a guy with a gun. What do you do to the mine? And then when you're in the middle of a minefield, what happens to you? You're helpless. You have to stop. You have to get down on your hands and knees. You have to walk out of it or very, very carefully move in a way that you know that any wrong movement can mean your life.*

*- Senior Officer, Infantry  
Somalia, Near East*

### **Desensitization.**

*After a while, the psychological effects wear off and it becomes another element of the theatre.*

*- Junior Officer, Engineer  
Operation Desert Storm, Bosnia*

*When I walked offroad with the infantry, generally, the point squad was observant and cautious, but the rest of the company just followed along at a low state of readiness--apathy bred from day after boring day of flying out in the morning and walking back 10 to 12 miles to their fire support base.*

*- Junior/Senior Officer, Engineer  
Vietnam, Germany*

Several respondents noted that soldiers become desensitized over time. In one case, because many soldiers did not exercise adequate caution despite being in an area of numerous minefields, the leader decided to move the unit before further complacency became the norm. In some cases, desensitization may have been due to the rarity or lack of mine encounters or incidents. One respondent noted that the pace of events and fatigue served to reduce the intensity associated with the mine threat. In some cases, familiarity with area led to complacency over time. Another respondent supported this notion by noting that there were more effects upon first entering the country, "when everything is unknown." Sometimes, however, soldiers do not become desensitized so much as they become burned out due to the stress associated with the constant threat of mines compounded with lack of sleep and other combat stressors over time. They might take on the attitude that there is nothing they can do about it and "fatalism" may set in.

*While there may have been some fear, my stronger feeling was a realization that the actual likelihood of encountering mines was a low probability and that lead to a fatalistic feeling--if your number comes up, it comes up; this is what soldiers, especially engineer soldiers, are expected to do.*

*- Junior Officer, Engineer  
Operation Desert Storm*

### **Training, experience, and equipment.**

*The amazing thing about land mines is that we expect them to be there and know what they can do to us, especially as engineers. After all, we are the ones who put them in the ground. ... As such, our perceptual set prepares us to seek them out.*

*- Junior Officer, Engineer  
Operation Desert Shield/Storm*

*As Engineers, are we scared of these mines? Hell Yes! We know what lies ahead for our adversaries and what destruction it will make, and we know it works both ways.*

*- Enlisted, Engineer  
Training, Operation Desert Storm*

A repeated theme involved references to training and how it affected soldiers' reactions. Several respondents indicated that mines have a greater psychological impact

on untrained or poorly trained troops and that fear of enemy APLs can be lessened or overcome by training. On the plus side, training gives soldiers a "healthy respect" of mines and provides them with knowledge about where mines might be and how to properly deal with them. One respondent spoke of "Mine Mentality" that comes from knowing about mines and what they can do.

One respondent explained three phases of land mine awareness: before, during, and after. The Before period referred to having training and knowledge about mines and, at this point, there was no effect on operations. The During period referred to encountering the first mine/minefield and realizing how susceptible and vulnerable one's unit was to mines. At this point, thoughts and decisions were made because of mines or suspected mines. Finally, the After period occurred after the unit experienced the devastation of a mine hit and, now, there were definite operational effects.

Training, however, may be a double-edged sword. Some respondents noted negative sides to training. Being knowledgeable about mines or being given mine awareness training may serve to increase anxiety or make soldiers unnecessarily paranoid. One Engineer noted that expecting them to be there and knowing what they can do may prepare soldiers to seek them out. Furthermore, encountering unknown mines or not being able to successfully analyze a particular mine configuration may lead to frustration or increased fear.

Along with training, amount of experience may also impact the psychological response but respondents differed in their assessment of the effect. Some respondents reported that younger soldiers were more likely to worry about mines. Other respondents reported the exact opposite: that combat veterans took them seriously while younger soldiers were less respectful of the mines.

Some respondents explained that availability of or confidence in equipment plays a role in one's reaction to mines. One respondent noted that soldiers without proper training and equipment are reluctant to move against mined positions and several linked lack of adequate detection equipment or low confidence in detection equipment to fear. Others used confidence in their armored vehicles as a way to alleviate their concerns.

### **Lasting effects.**

Some respondents commented that they still think about their mine encounter(s) or about how the mines they laid may now be impacting people, but only one respondent reported a specific lasting effect from their mine experiences:

*I felt the most threatened by mines while driving, especially when I was in Iraq. The roads are not like here, they are merely made out of compressed sand. As such, [mines] could be buried anywhere. I constantly was looking for tilt rods. Anytime my driver went off the main surface, I experienced an enhanced startle response. In fact, to this day, I can not sleep in the passenger seat of a car. Any little bump in the road instantly evokes that same startle response.*

*- Junior Officer, Engineer  
Operation Desert Shield/ Storm*



### **Injuries.**

*Soldiers that know the destructive powers of land mines are afraid of those possibilities.*

*- Junior Officer, Quartermaster  
Operations Joint Endeavor & Desert Shield/Storm*

Several respondents pointed to the "gruesome" and "grisly" injuries that landmines cause and their fear of being injured. In fact, one respondent indicated that there has to be some sort of "maiming and lethality capability" in order to have the psychological effect of mines. This respondent also noted that there is a degree of certainty involved in mine encounters: in contrast to a battle in which you may or may not get shot by a bullet, if you step on a landmine, "you're going to lose a leg, a foot, or a hand or something." Soldiers are aware that APLs are optimized to maim rather than kill and soldiers fear injuries such as losing a limb, genitals, or being blinded. The M16 (also known as the "Bouncing Betty") and other types of bounding fragmentation mines that jump in the air and explode, often about waist level, were sometimes particularly feared because of their ability to emasculate and because soldiers were sometimes only protected with body armor from the waist up. Furthermore, personal success in avoiding mines is not enough to guarantee safety - an individual may be wounded from the nearby blast when a fellow soldier steps on a mine. Whether others are wounded or not, soldiers are forced to watch and listen to comrades in excruciating pain after a detonation. One respondent explained that even if a soldier is "lucky enough to be killed, the effect is still gruesome, bloody, and violent." Finally, one respondent noted that enemy casualties are just as harmful as friendly casualties because soldiers learn to respect the courage and skill of their opponents.

### **Mine incidents and their psychological effects.**

*The mines never did bother me until we lost one of our own soldiers, because of stepping on a mine. He was only 19, my age at the time, I thought about it and said, that could have been me. It happened to one of the nicest guys you would ever meet, he would give his own shirt off his back for you. I think I took it pretty good, besides wanting to hurt one of our enemies more. As for a couple of guys in the squad, some were really upset and [it] took them a long time to get back in the right mine frame they needed to be in.*

*- Junior Enlisted, Infantry  
Operation Provide Comfort*

*I never met one of my soldiers, because he was MEDEVAC'd out an hour before I came to that Fire Support Base, after losing half a leg to a land mine. I had been told earlier in the day that one of our Engineer soldiers operating at a water point had been killed by a sniper the day before. This happened on my first day in a line Company in the field, after several*



*months at the Division base camp, where things were almost "safe." What a frightening and numbing sensation, and a shock. This was war for real!*  
*- Junior Officer, Engineer*  
*Vietnam*

A few respondents noted others' lack of concern about mines and predicted that it might take some sort of incident - an injury or a death - to increase soldiers' caution. Several respondents indicated that, indeed, soldiers were not concerned or did not have a "healthy respect" until an injury or death occurred. Emotions following mine incidents are quite varied. One respondent recalled that the mine blast made a "sickening sound" and another equated the shock of a mine blast that injured soldiers to incoming artillery or mortar rounds. Another found the number and severity of mine casualties observed during a visit to a hospital "sobering." One respondent reported that an incident did not have much of an impact on the soldiers as they knew there were mines all around them. Most respondents, however, noted reactions such as surprise, shock, consternation, feelings of upset, extreme nervousness, and feelings of vulnerability. In some cases, the fear lasted for the remainder of the tour or time in the country. Others reported that desensitization occurred again over time and another indicated that as all minestrikes resulted in injury only, rather than death, soldier confidence increased, approaching overconfidence at times. Mine incidents may bring back worries from training, increase caution among soldiers, may give younger soldiers an increased sense of danger, reinforce an unwillingness to dismount or move, slow rate of movement, increase negative feelings toward the enemy, and affect morale. One respondent noted that a mine incident in the unit caused discord as to who should be the lead platoon, squad, or soldier. Another respondent relayed how an incident led to an unwillingness to do much beyond the bare minimum to survive. Yet another recalled that troops being injured or killed led to feelings of outrage unlike any response to other casualties.

Some respondents reported experiences of having to rescue and/or treat mine victims. Typically, soldiers simply focused on the task at hand, with fear for the patient, determination to save the victim, and, perhaps, some fear for their own safety. One respondent recalled becoming a combat stress case after having to treat injuries to a civilian family similar to their own. Indeed, mine injuries may have a cascading effect on a unit. Mine casualties are almost always catastrophic. After an incident, rescue soldiers have to come into the minefield, deal with bringing rescue equipment and vehicles into a mined area, move through the minefield, and then deal with treating the injured. The end result can be a "debilitating effect" on the unit.

In some particular cases, respondents attributed the injury or death to the victim's actions, such as trying to dismantle a mine rather than just marking it and moving away, ignoring a warning sign and taking a short cut through a minefield, or doing something they were not supposed to do.

### **Psychological effects of UXO.**

*On one occasion my unit and adjacent units experienced injuries to soldiers resulting from UXO. The physiological and psychological impact of this is dramatic. It causes an extreme auditory alertness which simply*

*raises the stress level even higher. I witnessed soldiers becoming disoriented based upon ... the smallest encounter. A noticeable impact to the soldiers was the unwillingness to do much beyond the bare minimum to survive. Without strong leadership the soldiers became unwilling to be the first to ... move from point A to point B.*

*- Junior Officer, Engineer  
Operation Desert Storm*

*It was extremely frustrating to watch great soldiers get seriously injured by [UXO] while not under direct contact with the enemy. This was more like a friendly fire kind of thing which made it exceptionally frustrating.*

*- Junior Officer, Infantry  
Operation Desert Storm*

Many respondents had experiences with UXO and some identified it as a hazard equal to mines. In many ways, these experiences were very similar to mine experiences - causing similar emotions, similar reactions of freezing in place, and similar injury or death issues. One respondent recalled an emotional response of "cold blooded alertness" and reported that their senses "have never been so alive." In some cases, desensitization occurred over time. Some reported that, because UXO is often visible, it is often avoidable but, in some cases, the environment may cover them up. Several respondents indicated that UXO was a greater hazard and more of a concern than mines, often because of their more random dispersion. One respondent recalled a gunner who reached his "combat stress limit" after his vehicle was damaged by UXO. Even though no personnel were injured, the gunner froze and would not move because he was frightened when he realized how close to death he came.

#### **Psychological effects of friendly mines.**

*... I slept a little better in VN knowing we had mined the approaches to our positions. Now I sleep worse knowing the mines I planted are still blowing kids up.*

*- Junior Enlisted  
Vietnam*

Several respondents commented on the effects of U.S. mine use on U.S. soldiers. One respondent noted that they seemed almost as dangerous to emplace as to walk though. Overall, respondents reported that use of mines - typically for defense - made soldiers feel safe, provided a sense of comfort or security, and favorably affected soldiers' outlook and morale. One respondent noted that mines provide a "psychological edge to the force that's using them" and a "psychological degradation to the force that has to maneuver around them."

## **Operational Effects**

Although not the primary focus of this study, the second survey question addressed the respondent's perception of the operational effects of APLs. Respondents provided a variety of information and several key themes emerged. These key themes are discussed in the following subsections. As with the previous section, at least one respondent quote is incorporated into each subsection. The situation(s)/conflict(s) in which the individual encountered APLs or the threat thereof and the rank(s) and branch(s) (if provided by the participant) at that time are indicated. Ranks are presented in the same four groups used in the previous section.

Also as with the previous section, all of the information presented in this section represents comments made or information provided by respondents. In some cases, this information is provided in narrative format to aid readability. Phrases in quotes represent exact phrasing by participants.

### **Little/no operational effect.**

*You can't stop doing things just because they're dangerous. You just have to learn to do dangerous things safely. We trained our leaders and our men how to work in the environment and continued to perform our duties as required. Living in "imminent danger" is exciting and part of the fun of being a soldier.*

*- Junior Officer, Infantry  
Korea*

As with psychological effects, many respondents reported that there was little or no effect to the mission because of the presence or believed presence of mines. The mission didn't change or suffer and mines were merely a nuisance. In some cases only small effects resulted: missions were modified, but not canceled; mines changed the approach to the mission, but did not stop it; certain activities were delayed, but the soldiers were never prevented from completing a task; or there was a slight delay but the mission and avenue of approach did not change. Some respondents explained that they simply went around the minefields and that missions were generally very successful in spite of mines. Another respondent noted that had a mission change been suggested or ordered, it would have been questioned. One respondent noted that the threat and concern of mines did not keep the soldiers from "nosing around" after the war had ended.

Several respondents noted simply that they "knew they had a mission to complete," they "dealt with it and drove on," they continued to do the mission and just "did it under conditions of fear and stress," or they simply operated around the hazards. One respondent assumed that disruptions in the sand would be visible and that an avenue of approach would simply not be established in an enemy obstacle belt. Some attributed the lack of delay to the clearing ability of tank platoons or to the availability of air assets to move critical supplies. Some simply considered mines a "hazard out of branch" and left the task of dealing with mines or caring for injured or dead soldiers to those trained for and assigned to the task. Others experienced no delay due to the nature of their mission - soldiers who had to investigate minestrikes or engineers who dealt with mines,

for example. In such cases, those soldiers who were trained for and assigned to the task were in areas with explosive hazards on purpose.

### **Changes to the mission.**

*The sight of mines made me lose all focus on the environment around me; which if it had been actual combat with troops under my charge the situation would have been obvious chaotic.*

*- Senior Enlisted, Armor/Cavalry  
Operations Vigilant Warrior & Positive Force*

Although one respondent indicated that mines caused a "sharpening of focus" on the mission, most respondents reported some sort of negative operational effect. Some reported that mines caused a loss of focus on the mission. In many cases, the mission was changed, hindered, or stopped completely. One respondent indicated that mines "made the mission turn 180 degrees from original plans." Some noted that the effects of mines were exacerbated at night.

### **Elements of mission change.**

*I will honestly say if minefields or landmines do not delay, or cause to pause for anyone to assess what is possibly ahead, then the path they truly lead is to destruction.*

*- Enlisted, Engineer  
Training, Operation Desert Storm*

For many of the missions that were impacted, mines caused delay. In some cases the delay was minor and in some cases it was drastic. Minor delays were sometimes used for the unit's benefit to check vehicles, give soldiers a break, or used to instill situational awareness in soldiers. Another very common response was that the presence of mines slowed soldiers down and made them very careful where they walked or drove. One respondent reported that mines slowed down the execution of every mission. Another estimated that the primary mission took twice as long and others reported cases in which entire units had to shift positions until an area was deemed cleared and safe. "Mines constrain people," as one respondent put it.

Another common response noted by many respondents was that the presence of mines impacted movement - both dismounted and vehicular - in some fashion: making it more dangerous, difficult, or restricted. As one respondent noted, "the enemy who used mines probably got what they were after: a loathing to go into certain areas and a dread when it was inevitable." In many cases, extra care and caution were used during movements. One respondent recalled that, in Vietnam, soldiers preferred to ride on top of Armored Personnel Carriers (APCs) rather than inside because it was "better to be shot than to be trapped inside" in the event the APC hit a mine. Soldiers were often afraid to go anywhere not previously cleared and, as a result, stayed primarily in known or cleared areas and moved only on hard, paved, or well-walked paths. Soldiers often traveled only roads that had been traveled by others or went into fields only in which they had seen

local farmers. Areas which were known to be mined or which could have either been mined or concealed mines (such as snow covered areas or overgrown brush) were typically avoided. One respondent noted that, in (primarily) peacekeeping operations, troops who operated in mined areas came to learn the best ways to avoid mines and, after a while, simply did not go into certain areas - which also meant that they probably were not going into areas that were not mined:

*... if you stay on hardball roads ... in a third world country that means you get around to 1% of the area that you should be getting around and 99% of the area is denied to you.*

*- Senior Officer, Infantry  
Somalia, Near East*

Many respondents reported that dismounted movement was greatly hindered and, in some cases, avoided whenever possible. Some respondents were even ordered not to dismount when fueling. In one situation, commanders put out edicts against wandering around. Although one respondent suggested that they might not have slowed down as much in an armored vehicle, many reported that vehicular movement was, indeed, also affected. Driving was limited or restricted and some vehicular missions were rerouted - sometimes to more difficult routes - or canceled. As with dismounted movement, vehicular movement was slowed and limited to paved and/or cleared roads. Although leaders tried to direct people through routes which would minimize the chances of mine encounters, often that was not possible. Even if bypassing the mines was possible, it took time and, in combat, troops might be vulnerable to the enemy. Many respondents reported having to follow in tracks of previous vehicles and one reported having to put a soldier on the hood of the vehicle to look for tilt rods. One respondent noted that the presence of mines impacted the choice of the order of vehicles through the breaches. Another reported taking a helicopter when possible that, although faster, had to be borrowed from the S3. As testament to the effect of mines on movement, one respondent noted that lack of an APL threat led to "extreme sloppiness" in movement techniques.

Impacts on movement meant that troops were channeled away from expected placement or that maneuver and closing with the enemy was inhibited. Limiting movement to certain paths or areas might have had the effect of establishing patterns of movement which could be monitored by the enemy, thus leading to more mine setting. Furthermore, staying on roads made some respondents more vulnerable to ambush and artillery. One respondent noted that "fear of getting off roads gives the enemy an opportunity to exploit your weakness."

Often, all movements or actions had to take into account the possible presence of mines and missions were shaped by the requirement to find out about minefields. The presence of mines, then, often led to some sort of additional mission requirements. Additional tasks included tracking locations of mines, checking on locations before moving, monitoring roads and bridges, monitoring towns for activity, and checking for enemy presence. Although soldiers were sometimes warned against picking up or moving items that they did not put down, one respondent noted that such warnings were often difficult to heed during construction projects. In many cases, clearing procedures were necessary which cost time - more time than in training - and then impacted other

operations that had to wait for clearing to be complete. Some respondents noted that having to clear mines caused added stress, increased the fear felt, and gave mounted troops "time to imagine all kinds of bad stuff in their heads." Sometimes soldiers took shortcuts in an effort to save time: thoroughly searching only when there were signs of activity and conducting visual inspections from moving vehicles otherwise. Additional equipment, additional personnel, and training were also sometimes required. Additional mine detection and removal equipment, however, may have led to increased monetary costs which could have been used for other equipment or to help rebuild a country. In addition, configuring assets added time to the mission and caused delay. Vehicle damage and losses affected the ability to perform the mission and caused further delay. As one respondent noted, the threat of mines - even if they are never used - "strips both sides of assets."

Several respondents reported larger effects to the overall mission, the root of which was often the additional mission requirements. For example, during one construction project, time spent sweeping the area meant that much less time could be spent building, which had the ultimate effect of making the project take much longer to complete. One respondent noted that additional equipment (e.g., smoke, markers, sandbags, or kevlar) and personnel - to carry gear, secure sides, and suppress direct fire - led to an increased operation signature which, in turn, increased the risk of the operation. Thus, this respondent explained, the presence of mines, coupled with the resultant effects of additional time on the target, longer exposure to danger, extra personnel being exposed to danger, and increased possibility of having to stay longer to tend to injured personnel all served to increase the risks of soldiers getting hurt. Such increased risks meant that, in some cases, force protection became a more urgent issue. Sometimes, respondents noted, this ultimately degraded effectiveness. Others concurred, noting that keeping operations to previously cleared areas significantly limited the operation in some cases and that cautious or restricted movement reduced the speed of attack or element of surprise on the enemy. One respondent summarized that mines hinder tactical flexibility because soldiers are very concerned about where they are walking and what they are doing. In some cases, there was reluctance to attack possibly mined defensive locations. In other cases, more detailed planning was required and commanders had to develop several courses of action for mine encounters. Several respondents reported that mines were the foremost thought in making any tactical decision and others noted that mines altered the way all missions were approached. Commanders had to rethink approach routes and timetables and, in some cases, not all options were open. Furthermore, the commander may have had to carefully assess the rewards of a mission in mine-infested areas against the potential consequences. Nevertheless, one respondent noted that it was very rare when mines were the only significant factor considered when making decisions and that, although they were part of the equation, the "multiplying coefficient" varied with the situation.

*APLs/explosive devices caused soldiers to move with caution, to undertake missions with reluctance, and to experience severe morale problems over time. In trying to engage enemy forces in the area between Saigon and the Cambodian border, soldiers moved so cautiously through areas frequently mined that we seldom achieved surprise. If we could not land in a*



*helicopter, movement on foot was so slow and plodding that the VC and NVA elements succeeded in avoiding us most of the time. That effect of mines was obviously a great advantage to the enemy. Once soldiers had evacuated a significant number of their fellows who had been killed or maimed by mines/boobytraps, they did not move quickly in areas that might be mined. Night missions became especially problematic in potentially mined areas, limiting the aggressiveness of operations.*

*- Junior Officer, Infantry  
Vietnam*

### **Leadership issues.**

*Because mines are no more or less intimidating than any other weapon ..., the greater psychological burden for soldiers, and one which demoralizes them more than defeat, is the abuse and misuse of military resources by leaders. Men will take a hill once or twice, but not when it has been repeatedly given back to the enemy and then ordered to be taken again. Men will assault fortifications as long as they are convinced that their sacrifices are not wasted. Getting "wasted" ... by mine or bullet is rationalized if the "cause" is justifiable, and the mistakes are reasonable. A soldier's biggest fear is not harm, but stupidity!*

*- Junior Officer, Armor/Special Forces  
Vietnam*

Several respondents pointed to some type of leadership issue associated with mines. One respondent - a former commander - explained that their feelings unquestionably affected mission accomplishment and also explained that any sensitive commander "is going to balk at going into mined areas and will suggest other means to accomplish a given mission." Another concurred that their own fear led them to be cautious and protective of their soldiers. Some soldiers noted that leaders were obsessed with safety and concerned whenever risk increased for their units. To deal with the known or believed presence of mines, leaders sometimes cautioned soldiers extensively, teaching people to avoid danger areas and punishing violators. Leaders sometimes demonstrated reluctance for sending troops into commonly mined areas. Extensive training and strong leadership was sometimes required in order to prevent the presence of mines from paralyzing military operations and "leadership by example" was sometimes necessary during dismounted operations. One respondent noted that the fear was higher at senior leadership levels - to some degree because of experience - but, as a result, policies were enacted for force protection which "traded efficiency for safety" and, after about three to six months, pressure began to mount for "zero-defects." In the end, the presence of mines had the effect of curtailing missions but, as the respondent explained, the effect was from above and not below.

*... I had received my orders and knew the consequences. I was more scared for my soldiers, but I knew too we had to move forward or risk a outbreak of civil unrest in the sector. I felt my soldiers understood the*

*risk. The Battalion commander was delaying in moving us forward he wanted to create the right conditions. However, the ploy caused other Muslims to flank us. At some points in the movement I felt as if the soldiers were silently questioning my decision. The stares I received. I walked with the soldiers to try to build their confidence. Lead by example.*

*- Junior Officer, Military Police  
Bosnia*

### **Mine incidents and their operational effects.**

*Sitting in the bouncing ambulance and watching half a Russian torso bob up and down, bleeding all the while, is something that doesn't go away too quickly. Morbid.*

*- Junior Officer, Military Intelligence  
Georgia*

Although some respondents reported that mine incidents did not change or delay the mission, several respondents described how incidents did affect the mission. One respondent noted that landmines are used to maim rather than kill: a dead soldier can be left and retrieved later, an injured soldier, however, requires additional soldiers for removal from the battlefield and hurts morale.

At a minimum, incidents sometimes increased concern and caution among soldiers and led to delay. Several respondents described how rescuing injured soldiers presented a complex set of logistical problems. Troops had to slow down or stop, clear evacuation areas, obtain or provide medical attention, and successfully evacuate the injured. One respondent described an experience of a mission to clear APLs from around an existing fire support base in which some soldiers hit mines in the surrounding area. After the first soldiers stepped on the mine, medics rushed in to help and also stepped on mines, adding to the number of casualties. Attempts to extract the wounded by helicopter only added to the situation as the downdraft from the blades set off additional mines. The result was "total chaos" in which a number of soldiers lost feet and suffered other non-fatal injuries. Remarkably, no fatalities were recalled to have occurred.

Mine incidents sometimes provided "serious leadership challenges" and were used by some leaders to reinforce mine awareness. Vehicle movement often become limited and some incidents prompted investigations or renewals of basic training. In some cases, incidents disclosed concealment and operation intentions. In other cases, missions became more "deliberate" and only important missions were run immediately after mine strikes.

### **Type of mission.**

*And so it's hard to keep the peace - to get in between the two forces - when you have troops that aren't willing to get in there. In combat, it's different. In combat, you're willing to breach the minefields, there's a lot of other activity that goes on that causes you to take care of the mines and the concept of the operation. ... And it's also clear to the soldier that*



*we're not interested in him losing his or her life over maneuvering around in minefields. But the caution then creates an opportunity for people to exploit your weakness - you're unwilling to get off the roads. ... We try to believe that we have the strength, omnipotence, where we can look down and see everything from our spy satellites and our aircraft and everything, but the truth is we can't. The only way that you can really control an area in a peacekeeping operation is by having troops patrol and actually being in the areas.*

*- Senior Officer, Infantry  
Somalia, Near East*

A few respondents noted that the type of mission played a role in the impact of mines. Specifically, peacekeeping or other non-combat missions were often on a much more flexible timetable and, consequently, were not as affected by delay. Thus, soldiers could afford to be cautious and deliberate. Furthermore, a "protect the force" mentality was often a part of such missions. As one respondent indicated, the number of U.S. casualties was the only real standard by which to measure success.

One respondent provided several insights into the differential effects of mines in combat compared to peacekeeping missions. First, this respondent noted that soldiers gain tactical familiarity with the most likely places for mines to be. However, in situations not involving professional armies, this might not be the case and, in one experience, a scout platoon was traumatized by both the large number of casualties and by repeatedly running into mines in unexpected locations. This sort of situation had the potential to seriously impair the tactical ability of small unit commanders to make decisions.

This respondent also recalled that, on one particular peacekeeping mission, while trying to separate two warring factions, U.S. soldiers were trapped in the middle of landmine management: one side laid mines and then the other side would pick them up and re-lay them someplace else with the result being that the mines were impossible to keep track of. Sometimes U.S. forces would mark the minefields only to have one of the sides remove the mines and emplace them somewhere else.

The respondent noted that, in a peacekeeping situation, soldiers have nobody to "get back at" because nobody is actually shooting at them but that, in wartime, mines are part of the hazard of the battlefield and soldiers take a greater risk. In a peacekeeping operation, commanders and troops do not take that risk and are much less willing to risk life and limb.

In terms of mission accomplishment, this respondent noted that, in order to control an area in a peacekeeping operation, troops have to patrol and actually be in the areas - which is difficult if troops do not want to patrol in areas because of fear that they are mined. Furthermore, in combat, soldiers likely have the equipment to fight their way through the mines but, in peacekeeping, they likely do not have the density of equipment necessary to detect or destroy the large number of mines present. As a result, in peacekeeping operations, commanders may not send soldiers in to breach minefields, instead locals are often hired to clear the mines.

### **Operational effects of UXO.**

*... although the UXO was dense it was a lot easier for us to move around than if the area had been seeded with anti-personnel mines. That's because we had high confidence that we could see the UXO - that wouldn't be so for a trip line.*

*- Civilian  
Operation Desert Storm*

In addition to mines, UXO was also identified by several respondents as having operational effects. One did not anticipate that there would be as much trouble with UXO as was experienced. In most cases it was regarded as a safety issue but, in some cases, it led to effects similar to those caused by mines: increased caution among soldiers; movement limited to hard surfaces; mission changed, slowed, delayed, or rerouted; clearance requirements; damaged equipment; and compromised missions.

### **Operational effects of friendly mines.**

*APLs had a very positive effect on my mission accomplishment. During a time when our platoons were undermanned, use of APLs allowed for rear and flank security for small unit operations. They were also useful as early warning devices that allowed squads and platoons to consolidate and relocate because of the size of the enemy force coming against them. On offensive operations locating, marking and neutralizing enemy APLs could cause some delay. In combat, APLs definitely influenced the battle, in some cases dramatically ending the fight.*

*- Junior Officer, Infantry  
Vietnam*

Several respondents commented on the operational effects of mine use by U.S. forces. Some identified negative aspects of mine use such as the danger that U.S. soldiers would accidentally trip them or that friendly mines did not guarantee security and could not be trusted to keep the enemy out. One expressed sadness at doubt that they were removed after the U.S. pulled out of the country. Most of the respondents who addressed this issue, however, reported some sort of positive effect on mission accomplishment, usually in defensive situations, labeling them "essential to the mission" or stating that they "helped support our mission." As one respondent put it, "the landmine gives an incredible boost to the defendant in combat." This respondent also noted that mines are a great weapon of convenience and are cheap and easy to use, especially for small forces, because they do not require eternal vigilance. One respondent argued against the risk to U.S. soldiers, noting that friendly troops knew where they were and stayed away. In one case, they were reported to allow for rear or flank security for small unit operations when platoons were undermanned. In other cases, they functioned as early warning devices and effective deterrents. One respondent proposed that the minefields generated fear and respect among the civilians and enemy because the U.S. troops repeatedly gave demonstrations of their effectiveness. Although some praised Claymores, one respondent

suggested they were an ineffective deterrent that, because they are command detonated, depended upon a vigilant security force. Some expressed the opinion that the current situation in Korea depends on the use of mines to prevent infiltration from the north. Mines in both offensive and defensive roles in Vietnam were deemed essential as components of psychological operations on the enemy, as a force multiplier, and for defense. One respondent commented that, in most cases, mines are an effective tool in battle and that, although they should not be randomly dispersed, they do serve a purpose in combat.

*... we were always glad we had our own mines. An Army or Marine Corps without the ability to employ defensive mines around our positions? I'm glad that stupidity was never imposed on me.*

*- Junior Officer, Armor  
Vietnam*

### **Comments Regarding an APL Ban and APL Alternatives**

*The mines I came in contact with were of Chinese, Vietnamese, and US manufacture. Although the war is long over, these mines are still quite efficient at killing and injuring the civilians who still live in the area. On many occasions I met civilians who had been wounded by mines and unexploded sub-munitions. Seeing their suffering has made me question the function and morality of mines. I have significant problems reconciling the use of weapons that can not be easily removed after a conflict has ended or weapons that can not differentiate between soldier and non-combatant child.*

*- Junior Officer, Ordnance  
Vietnam, Laos*

*I would like to see war outlawed, not just land mines. But since this is not possible, given human nature, I strongly support the ban on use of all kinds of mines and booby traps. I don't want us to use them, and I don't want the other side to use them.*

*- Senior Officer, Armor  
Vietnam*

Although the survey did not specifically address the APL ban or APL alternatives, several respondents volunteered their opinion. One respondent predicted that the inability to use APLs will cause a "significant rethink of many operational techniques." Another suggested that a prohibition against APLs could not be enforced and that the enemy would not obey "rules" just because the U.S. does. This respondent pointed out that the booby-traps used by the Viet Cong and North Vietnamese Army in Vietnam were not permitted by the Geneva Accords and that, although U.S. troops were not allowed to use them, this did not stop the enemy from using them. Another respondent, opposed to a ban on landmines, also questioned how such a ban would be enforced. A third respondent noted that sophisticated countries will, undoubtedly, ban mines but guerrilla

forces probably won't, given that the problem with mines are generally with use by undisciplined forces rather than with disciplined forces. This respondent further noted that some forces may want to inflict casualties on the enemy and leave a terror weapon behind and that, as a "poor man's weapon," some people would rather have mines than personal weapons such as rifles to protect them.

*Our advanced self-destructing mines are the most humane minefields made yet possess all of the capabilities to impact the psychological balance and focus of combat units ... No other threat is similar. I can see the [artillery] falling - I can scout out the tanks in front of me. But I can't avoid both of those nearly as well as when I'm looking down in the dirt in front of me looking for land mines.*

*In some deliberate defense scenarios such as Korea, cheap, dumb landmines make enormous sense as a deterrent to the enemy. But hey, that's just combat experience talking; I'm profoundly unappreciative of the politics about mines. To save civilian lives we ought make more Volcano, ADAMs and GATOR smart mines and replace the older sets of dumb non-self-destructing mines. As for outlawing AP mines - you will simply deny me a tool to attack the enemy that he will surely use against me.*

*- Junior Officer, Engineer  
Training, Operation Desert Shield/Storm*

One respondent commented at length about the role landmines play and questioned how they could be replaced. The respondent explained that what is needed in combat is something that slows down the enemy and that landmines allow a force the opportunity to even the odds when outnumbered. The respondent explained that, for a military force, mines are always covered by direct fire so that if the enemy is stopped having to clear the minefield, troops can kill them with their direct fire weapons. Thus, this respondent noted that "if the object is to kill them, then I sure would like to have mines at my disposal in any battle that I'm fighting outnumbered." The respondent added that American soldiers are pretty comfortable with a timed mine that does not last forever yet still slows down the enemy. Another respondent commented similarly:

*If we cannot integrate fires with barriers and use the orchestrating of these means, our early entry forces who fight outnumbered are at severe risk. Use mines in a responsible manner as the United States always has. Do not hold the American Combat in tethers and chains because others are unprofessional.*

*- Junior Officer, Field Artillery  
Vietnam*

On the issue of lethality, one respondent noted that they wanted every possible means at their disposal to fight and win with the least amount of U.S. casualties and that if there was some non-lethal way to do it, that was acceptable. However the respondent did not know of any current methods to do so and posed the questions "What provides the psychological impact of losing your legs?" and "If you disable the enemy, what will you

do next?" The respondent noted that commanders may, in fact, send troops into non-lethal mines to clear them so that the remaining troops can go through and that this would pose no problem if it resulted only in temporary disablement rather than casualties.

*I'll be honest with you. Trying to make war more humane does all of us a disservice. The more gruesome it is, the less willing we are to get in the middle of it. And the more humane we make it, the more willing we'll be to resort to force. So, sometimes we need to check just what the ultimate effect of some of these good ideas will be. When it's a matter of life and death, I want to have the ability to inflict the same pain upon the enemy that the enemy's going to inflict upon my men. The worse thing I can think of to happen is that we become a force so enamored with non-lethality that the notion of "kill or be killed" just turns into the notion of "be killed." Certainly, we'd like to do it without killing people but, from a soldier's point of view, I don't think we're anywhere close.*

*- Senior Officer, Infantry  
Middle East*

### **One Soldier's Story**

What follows is one soldier's story of an encounter with mines. It is included in this report because it illustrates many of the points raised in the preceding sections about the psychological and operational effects of APLs. Identifying information about the incident has been deleted and some details have been modified slightly to maintain anonymity. Names have been changed and are not functions of the original names of the individuals involved.

*One Friday, some of our platoon was going to rotate in to the local city for a command and staff type weekend meeting and to get to bathe and sleep in a hotel. The conditions at our base were very austere, and everyone rotated in for a weekend once a month.*

*For whatever reasons, we had to fly on Cessna-type aircraft taxis. These were just regular two-door Cessnas with an extra back seat but it was the only safe transportation to the city. The road west was notorious for ambushes and war tax roadblocks. (We later lost men on that road in an ambush.) So that's why we used to fly. These little air taxis took off and landed on a dirt strip about 5ks west of our base. I wasn't scheduled to rotate into the big city, but I rode out to the airstrip with CPT Stewart and the three NCOs who were going to fly out that afternoon.*

*SGT Mark Andrews, the platoon's medic, was my friend. We always worked together and so we generally went everywhere together. He was a great medic, but kind of a careless infantryman, so, being my junior, I thought I'd go to the airstrip and see him off. SFC Collins made him my responsibility so I took it pretty seriously.*

*The strip was just a dirt runway with no buildings or tower, but it landed fixed wing aircraft to resupply our unit. It was too dangerous to transport ammo over the roads. A WWII vintage DC-3 had just landed as we arrived - I remember because I liked*

*vintage aircraft as a kid. There were two or three Cessnas lined up waiting to take off when we got there. They seated about four passengers, if someone sat next the pilot.*

*The platoon sergeant sent me to the shack to get us on the sign-up list. There were 20 or so civilians waiting around, but the civilians were always respectful and subservient toward us so I knew we would not have to wait to get our guys on board. I got two on the first aircraft and two on the second. I can't remember whose name I put where, I just remember doing it. It was like taxis in NY: there was no competition, when they filled one, it took off. I told Collins the plan but he didn't like it. Collins wanted everyone on the same aircraft, which wasn't how I signed us up. He had been wounded (and decorated for valor) in a previous US engagement and could be very difficult when it came to security issues. A little irritated, I went back to the shack and talked some nice people into switching from the second aircraft to the first, so Collins could have his way. The civilians were very accommodating and some kids switched the bags around and off the first plane went.*

*The plane did an engine run up then took off. We were waiting for the noise to pass, when we heard an explosion. Everyone on the team had been under fire before, so Andrews and I found a ditch pretty quick. I figured we were under ground attack and were about to get our asses kicked, being in flat land with little cover. The civilians started panicking but, like most civilians in a country at war, they had the sense to find cover. After a few seconds of quick planning among ourselves and two riflemen we brought with us, we noticed we weren't coming under ground fire. Some woman started wailing about the avion and when I looked down the runway, the tail of the plane was standing straight up and this ugly black cloud was just drifting by. We still waited another few seconds then Andrews took off running toward the plane. Stewart started running and yelling at him at the same time. I followed but still wasn't sure if this was the smartest thing we could do, I still had the idea it could have been a recoilless rifle shot, or rifle grenade. We all got to the plane at the same time. It was a mine. It had made an ugly crater and partially uncovered another unexploded mine. The uncovered was a wooden box type mine. The engine and front wheel was down the runway another 40 meters or so. The explosion sheared the nose right off. Andrews started pulling the pilot out; Stewart started pulling on the mangled door. The plane's back was broken, tail up, but the fuselage was still on its side blocking the left door. We didn't have anything to pry with and the people that were conscious kept screaming to get them out. The two in the front were in bad shape but still were strapped in. The explosion blew both their arms and legs off at the joints, but covered them with a volcanic ash, which kind of coagulated the amputations. They looked like stuffed animals, grey with stubby arms and legs. I don't know if they had eyes, but there were red gaps in their faces and their mouths were open with red gel that was oozing out. Andrews was giving them first aid, but I don't know why. Andrews always carried, actually wore, a vest of medical equipment he designed himself. He didn't have it on that day and, after that day, he never took it off when we went outside the wire. He never would quit - he was trying to tourniquet the two worse with the rags that used to be their clothes. Stewart and I helped the guys in the back seat out. They weren't as grey but they were seriously wounded. Strangely, a helicopter that was evacuating two routine patients from a unit in the field, saw the explosion from overhead and landed almost on top of us making things more confusing in the dust and the noise. It was an old helicopter like on MASH where the*



*patients rode in two stretchers outside the control bubble. We pulled the two walking wounded soldiers off and put the two worse cases on the helicopter, and the rest of the wounded we put on a van to drive to the hospital. We were trying to clear people away from the wreck because of the fuel leak and the other mine and I noticed a boy, crying. He had blood coming out of both ears and was crying and not making a lot of sense. It dawned on me he was the pilot's son that switched our bags just a few minutes before. He had ridden behind the back seat almost in the tail boom, when they struck the mine. I felt pretty helpless watching that boy wander off, I didn't know what to say or do. Stewart gathered us up and we got on the vehicles to return to our headquarters. We were all covered with blood and ash and fuel. The other two didn't go forward to the plane, they pulled security by the shack. None of us talked a lot for a while. To this day, it's probably the worst thing I've witnessed, and I thought a lot about that when I drove around another mined country earlier this year.*

*Earlier this summer, we had a reunion. For two nights we sat in Gene Payne's (another platoon member) backyard by his pool and talked until about two in the morning. Our wives sat at the edge of the pool, with their feet in the water, some getting to know each other and, like my wife, Diane, and Collins' wife, Cindy, it was reliving a lot of old times. As us five who were there that day sat by the pool, I wondered how that mine almost changed my life. Who would not have been sitting there drinking scotch and smoking cigars, laughing, (and crying) in the dark, and telling stories if we had not changed airplanes. The wives sat and watched us, never having heard some of the stories. I had forgot a lot of them too.*

*I don't think too much about the seats I traded away. I didn't mean for it to end the way it did, it was just the way it happened. I feel bad when I think about the boy and the families and all. It wasn't the last terrible thing that happened to us there, but it lingers in my mind and I think about it whenever we start talking about mines and what they do.*

## **Discussion**

Overall, the results of this study nicely complement the points raised in the literature regarding both the psychological and operational effects of APLs. The data gathered on both aspects of APLs revealed several key themes about the two effects. Examination of these key themes leads to several conclusions about the psychological and operational effects of APLs. These conclusions are discussed in the following two subsections. Utilization of the findings of this study and areas for future research are then discussed in the final two subsections.

### **Psychological Effects**

As noted earlier in this report, many references are made in the literature to the "psychological effects" of enemy landmines on soldiers. However, it appears that no previous study has measured or documented just what those effects are. It is intuitively obvious that fear is a major effect. People, however, are afraid of many things: heights, spiders, clowns, the dark, etc. The same term - fear - is used to describe all of these

feelings, yet they are not all exactly the same. What are the elements involved with the fear associated with APLs? What other feelings do APLs evoke? Why do APLs evoke these feelings? Several answers to these questions were provided by this study. Overall, there were four primary conclusions regarding the psychological effects of APLs.

*1. APLs do not always cause significant psychological effects.*

There are large individual differences in the effects of APLs on soldiers. Soldiers may try to focus on their jobs instead of thinking about the threat. Lack of effect may be due to the degree of control – actual or perceived – the soldier has (e.g., knowing or believing to know where the mines are and how to deal with the mines; confidence in equipment and other soldiers; not fearing injuries), the types of tasks assigned to the soldier (e.g., dismounted vs. mounted action; having to move vs. being relatively stationary; operations in mined vs. safe areas), and comparison to other threats (the “sum of battlefield conditions,” as identified by Gullick, personal communication, August 18, 1998).

*2. The primary psychological effect of APLs is fear but other emotions are also possible.*

In general, APLs are stressors which cause fear, the degree of which varies with the soldier and situation. Dominant fears are fear of the unknown and fear of being maimed. Fear may be linked to particular locations or activities. It may lead to reluctance in soldiers to do certain tasks or missions. Soldiers may try to manage fear by thinking through a plan or gaining knowledge – in other words, increasing their own control (actual or perceived) of the situation. In some individuals, APLs cause emotions other than fear: respect, caution, concern, frustration, anger, or disgust. Negative emotions may cause morale problems among soldiers and affect their attitudes. They may also impact the attitude toward the enemy or the conflict – positively or negatively, but most likely negatively. In support of Lambert’s (1952) “National Characteristics,” soldiers from other nations may have different responses to mines. They may be more reckless around mines or may feel that an injury results because of some sort of personal bad luck. Recall that Gullick (personal communication, August 18, 1998) noted that leadership style exerted on the soldier – such as being forced to sacrifice oneself in order clear a minefield – may also impact a soldier’s response to APLs.

Whatever the effects of mines, soldiers often become desensitized to the threat over time. This may be an extension of the well-established “inverted U” relationship between stress and human performance: as stress increases, performance increases until some optimal level of stress is achieved. Beyond the optimal level of stress, performance decreases. That performance has decreased may be demonstrated by an increase in errors or bad judgment. Furthermore, stress can build up over time. Recall that Kirkland, Halverson, and Bliese (1996) noted that continuous fear can be a combat stressor. Applying these principles to the stress induced by APLs, the prediction is that once the stress associated with APLs exceeds an individual’s optimal level, performance will decrease. The individual may break down and become a combat stress case or the individual may simply become desensitized to the threat. In the latter case, it may be that the APLs are no longer causing stress (as might occur if mine encounters are very rare)



or, perhaps, that they are causing so much stress (as might occur if the mine threat is very great) that the individual has, in effect, become "numb" or "burned out" in much the same way that human sensory systems become adapted to constant stimuli. This, again, ties into Gullick's "sum of battlefield conditions" (personal communication, August 18, 1998). In either case, a form of "learned helplessness" - in which soldiers draw the conclusion that there is simply nothing they can do to change their bad situation - may also occur.

Aside from thoughts about their mine experiences, soldiers do not typically appear to experience any significant lasting effects (aside from any injuries incurred in a mine encounter). The case of the one respondent who now experiences an enhanced startle response is most likely best explained through classical conditioning. Prior to being deployed in a mine-infested area, bumps in the road while driving caused no reaction. While deployed in the mine-infested area, a bump in the road meant that the vehicle had gone off the main surface and, thus, had increased the chance of encountering a mine - certainly a startle-evoking situation. After repeated pairings of the bump and the increased threat, over time, the bump in the road alone evoked the startle response.

*3. The major factors involved in the psychological effects of APLs are control, the inability to fight back against them, risk, and uncertainty.*

The psychological effects appear to stem from several aspects of APLs.

***Control and fighting back*** As alluded to by Holmes (1985), a primary aspect of APLs is that they remove control from the soldier over their own actions, safety, and destiny. Furthermore, as noted by Holmes and Greer and Bartholomew (1996), APLs are an inhuman threat which soldiers cannot "fight back" against in an effort to mitigate the stress they induce. When soldiers are able to "fight back" by successfully detecting mines or disarming them, it sometimes provides soldiers with good feelings such as accomplishment. In a related vein, being able to attribute a particular mine injury or death to some action on the victim's part (e.g., dismantling a mine without proper training or ignoring a minefield warning sign) may lead to a slight increase in control in the mind of the soldier through reasoning that they can avoid the threat by not doing what the victim did.

As predicted by Gullick (personal communication, August 18, 1998), training generally appears to reduce the fear associated with APLs, most likely because it increases the soldier's perception of control due to an increase in knowledge about how mines work and where they may be. It is well known that performing an easy - or well-learned - task does not increase one's stress level, hence the individual may be closer to their optimal level on the inverted U curve. Training also provides concrete strategies for dealing with the APL threat and likely increases confidence and personal discipline which, as noted by Gullick, likely decrease the effects of APLs. This may also explain why trained soldiers sometimes experience frustration if they are unsuccessful in dealing with a particular mine or mine threat: not being able to deal with a threat because one has no control over it may be frustrating, but having control in the form of knowledge or skills and still not being able to deal with a threat is likely to be even more frustrating.

Alternatively, training may increase the fear associated with APLs. One respondent wrote of "perceptual set," a condition in which an individual's expectations

prepare them to perceive the world in a particular way. Thus, mine training may make a soldier hypersensitive to the mine threat. For example, an engineer who has recently completed live mine training during which they were constantly exposed to mines, might go out into the field with mines very much on their mind.

Experience may play a role in decreasing the psychological effect of mines in much the same way that training does - experience gives the soldier valuable knowledge and increases control or perception thereof. Experience, in terms of familiarity with an area, may be a factor involved in the desensitization that often occurs. Thus, an inexperienced soldier may be predicted to experience a greater psychological effect from APLs because of lack of knowledge. An inexperienced soldier may also not fully appreciate the threat posed by APLs. Alternatively, an experienced soldier may experience a greater psychological effect because of exaggerating the threat or because of perceptual set - similar to the "mine consciousness" discussed by Lambert (1952).

Availability of and confidence in necessary equipment may also be related to the psychological effect of APLs. Having equipment for detection provides the soldier with a concrete method of dealing with the threat, thereby increasing control over the situation. High confidence in the equipment will help to decrease the stress and fear, whereas low confidence will likely increase it.

**Risk** Tied to control is perception of risk. As noted by one respondent, the less control of risk individuals have, the less risk they are willing to accept. As applied to APLs, because soldiers have virtually no control of the risks of encountering mines, they may not be willing to accept much risk. In comparison, soldiers have some degree of control against other threats such as artillery in that they can try to outrun the threat or fight against it. There is virtually no way to fight against the mine threat either when faced with mines or after one has been detonated except by limiting movement to avoid them or freezing in place if they are encountered - acts which, by their nature, reduce control and increase feelings of helplessness. Helplessness can be viewed as a condition of no control. By increasing control of the APL risk in some manner (e.g., being able to or forced to take other routes), soldiers will likely increase the amount of risk they are willing to accept and the psychological effect will likely decrease. Should a soldier have the misfortune to trigger a mine, the resulting state is one in which they will most likely be completely helpless to save themselves and will likely have to depend upon fellow soldiers for their very survival - again, a condition of no control.

**Uncertainty** There is a lot of uncertainty associated with APLs: they are both hard to see and hard to detect - an observation supported by Mazion (personal communication, July 16, 1998). Even if an area has been cleared, there is no way to know if it has been 100% cleared. In addition, the environment can change the locations of mines, further adding to the uncertainty, and there may be no way to know if this has happened. Thus, it might be the case that a minefield is marked (decreasing uncertainty), environmental conditions move the minefield (bringing back the uncertainty), but whether that has taken place may be unknown (increasing the uncertainty). The net result may actually be an increase in uncertainty!

Recall that Greer and Bartholomew (1996) noted that the real effect of mines comes from an exaggerated fear of the unknown, as well as an inability to know the true threat. This is clearly illustrated by the respondent who noted that "when you start to multiply what's really there versus what could be there, what's really there is in 10% of

the area and what could be there is in 100% of the area.” Furthermore, tying to the aspect of risk, Greer and Bartholomew noted that the psychological effect is increased by the risk of dire consequences associated with an underrated threat. Thus, following from Greer and Bartholomew’s “all-or-nothing” thinking, any mine threat would most likely be perceived as serious. Adding additional uncertainty is the acknowledgment that advances in mine warfare have been such that the increase in undetectability of mines has not been accompanied by a corresponding increase in countermine capability.

The reduced fear sometimes associated with UXO is likely a function of the fact that, even though the injury/death threat is the same as for APLs, UXO is often plainly visible and, hence, easily avoidable – an observation supported by Bier, Grzyb, and Stevens (1998). This markedly decreases the uncertainty associated with UXO. Thus, soldiers can often control their risk associated with UXO. However, in some cases, UXO may be perceived as a greater threat simply because it is more plentiful and is, probabilistically, a greater threat than APLs – another example of Gullick’s “sum of battlefield conditions” (personal communication, August 18, 1998). Randomness associated with UXO increases the uncertainty – thereby decreasing the control – associated with being able to assess the threat and may add to overestimation of the threat in another example of Greer and Bartholomew’s (1996) ‘all-or-none’ thinking. The “friendly fire”-like aspect associated with an injury from one’s own UXO may further increase the fear and negative feelings associated with UXO.

Although soldiers may become familiar with where the mines are most likely to be in a tactical sense, this may not reduce the psychological effect, perhaps because they do not really know if their predictions are correct until it is too late. In other words, they have reduced uncertainty but have low confidence in their knowledge, the combination of which leads to an increased psychological effect. Conversely, in a situation with high certainty and high confidence in that certainty – such as in the DMZ or Berlin – respondents suggested that knowing the location of the mines or minefield may, in fact, reduce the psychological effect.

*4. The fear induced by APLs is most likely primarily caused by the types of injuries they inflict and the certainty of those injuries if a mine detonates.*

The types of injuries caused by APLs are, undoubtedly, a major – if not the primary – element of the fear and stress that they cause – a conclusion supported by Smith (personal communication, July 6, 1998). Soldiers know with grisly detail what might happen to them if they or a fellow soldier triggers a mine. Thus, “fear of APLs” may actually be “fear of being gruesomely injured or killed.” Recall the one respondent who indicated that, in order to have the psychological effect of mines, there has to be some sort of maiming and lethality capability. This respondent also pointed to another aspect of APLs: the result of triggering a mine is the only real certainty about them. Indeed, a translation of a 1948 French Far East mine manual warns the reader, “Beware! If you step on a tiger’s tail you may have one chance in a hundred of surviving. If you step on a mine, you don’t have one chance in a thousand.” (Battelle Memorial Institute, 1948, p. 7)

Soldiers may be especially anxious about emasculating injuries that can result from bounding fragmentation mines. The possibility of injury not from personally

stepping on a mine but from a nearby soldier stepping on a mine only further reduces a soldier's feelings of control: no matter how careful one is, injuries or death may still result because of the actions of a fellow soldier. Even if not personally injured, having to watch a fellow soldier who has fallen victim to a mine is traumatic - especially given the inability to help because of constraints on movement - and having to treat an injured soldier can also be traumatic because of the gruesome injuries. It may also lead to a realization of "that could have been me" and a sense of one's own mortality and personal risk. Injuries may impact soldier morale and attitude towards the enemy, leaders, or the conflict/situation. Injuries are salient events which may also increase caution among soldiers; cause discord as to who should be the lead platoon, squad, or soldier; and reinforce an unwillingness to dismount or move - responses that may, ultimately, impact the operation. Furthermore, as can be inferred from Boulden (1997), having to return to the battlefield or an area after a comrade is injured from a mine is likely to result in anxiety.

Recall that one respondent noted that enemy casualties are just as harmful as friendly casualties because soldiers learn to respect the courage and skill of their opponents. Furthermore, Grossman (cited in Kirkland, Halverson, & Bliese, 1996) found taking the life of an enemy soldier to be the most stressful event a soldier encounters. If a soldier feels personally responsible for an enemy mine encounter, perhaps because of having emplaced the mine, the enemy casualty may cause stress rather than an increase in respect and skill.

### **Operational Effects**

Although not the focus of this study, the operational effects of APLs were tangentially explored. The doctrinal use and function of APLs may be objective and straightforward, but opinions as to how successful they are in carrying out that function vary widely. This study provided some opinions regarding the operational effects of APLs from some experienced judges - soldiers who had to deal with enemy mines. Overall, there were five primary conclusions regarding the operational effects of APLs.

#### *1. Typically, APLs do not completely stop a mission.*

Many times the presence or believed presence of APLs may have no significant operational effect. Although there is typically some sort of negative operational effect, ultimately, the mission is completed. Only in rare cases does it appear that the mission is stopped completely. Overall, APLs may simply be accepted as one of the hazards of war that has to be dealt with.

#### *2. APLs almost always have some sort of operational effect. Overall, they constrain and slow.*

That APLs do not usually completely stop a mission is not to say that APLs have no operational effect! As noted, they almost always cause some sort of effect. Typical effects are

- delay of varying length.

- increases in force protection measures and concerns (which may negatively impact efficiency).
- injuries that, exactly as predicted, are typically time, equipment, and personnel intensive. Despite the fact that the presence of mines slow movement, speed in rescuing injured soldiers is critical: recall that Stover, Kelley, Cobey, and Sopheap (1994) noted that 6 hours between injury and treatment is the maximum safest delay.
- impacts to both dismounted and vehicular movement (e.g., increasing caution; causing limited or restricted movement; rerouting movement). The impacts on movement commonly reported in this study support the doctrinal notion that mines serve to channel troops and shape the battlefield.
- impacts to how the mission is approached (e.g., order of vehicles; routes employed).
- limits on tactical flexibility.
- additional mission requirements (e.g., monitoring area activity; additional equipment; additional personnel).
- the necessitation of additional planning (e.g., having to rethink approach routes and timetables).
- the necessitation of detecting, tracking, and clearing mines - all of which take time away from other mission tasks. Furthermore, the act of clearing mines may add to soldiers' stress levels. Alternatively, as noted earlier, it may ultimately reduce their stress level because of increased feelings of control and having "fought back."
- morale problems which, in turn reduce soldiers' willingness to carry out certain tasks or the mission. They may also lead soldiers to question their leaders and leadership - an obvious hindrance to any military operation. As a result, leaders may be forced to "rise to the occasion."
- larger effects (e.g., projects taking significantly longer to complete; increased risk of the operation).

### *3. The type of mission plays an important role in the specific operational effects of APLs.*

For conflicts not involving professional armies, APLs are not likely to be placed according to any formal doctrine, thus limiting the ability of soldiers to predict their most likely locations. Conflicts involving warring factions may lead to constant emplacing, removing, and re-emplacement of mines by the various sides, making it virtually impossible to keep track of their locations.

At the most basic level, soldiers and leaders will not be as likely to take as many risks in non-combat missions: leaders and soldiers alike will be less willing to risk injury and death. In peacekeeping operations, equipment to detect and destroy the mines may be limited. Peacekeeping operations also further limit the soldier's ability to "fight back" compared to combat situations. In combat, frustration over mines and mine incidents can possibly be directed back at the enemy over the course of battle. In a peacekeeping operation, however, such an outlet for frustration is not likely available.

Missions that are not on a strict timetable may not be greatly affected by delay. However, limits or restrictions on movement may, ultimately, limit the success of certain operations. For peacekeeping operations involving patrols, for example, fear caused by mines may limit troops to certain areas which, ultimately, means that they do not patrol all of the areas in which patrolling is needed.

*4. A primary aspect of the operational effects of APLs is the cascading nature of their effects.*

A critical aspect of the operational effects of APLs is their cascading nature: one thing causes another thing which causes something else which causes yet another thing. This cascading effect can be relatively simple or relatively complex. In a simple case, for example, the presence of mines may cause enough fear in soldiers and worries about soldier safety among leadership that, as a result, entire units shift positions. In another simple example, the presence of mines may necessitate a clearing procedure, taking time and money, which both sets back a construction project and uses up assets.

The cascading effect is clear with the complex interplay of time, equipment, and personnel involved in treating soldiers injured by mines. Furthermore, the effects of an incident may continue to cascade long after the individual soldier is safely in the medical station. An injury may prompt an investigation, additional training, reduce personnel and equipment, reveal the unit's location, limit missions after the incident, and, ultimately, compromise the mission.

In a more complicated example, the presence of mines may cause fear, which may necessitate clearing, which may both decrease the speed of the attack and necessitate bringing in additional equipment, both of which may decrease the element of surprise on the enemy, which may give the enemy time to plan and execute a counter-attack, which, ultimately, may impact the chances of mission success. All this because the presence or believed presence of mines caused fear!

*5. The exact nature of the operational effects of APLs in a given situation is a complicated function of many factors. The perceived operational effectiveness of APLs may be an important psychological effect in and of itself.*

Respondents in this study who had experience using mines in an operation supported the points raised in the literature about the use of mines for such things as defense, early warning devices, and force multiplying. Furthermore, respondents indicated that use of one's own mines does often provide a sense of security. This likely comes from an increase in knowledge in terms of knowing how to use them and what they can do to the enemy. Although some respondents suggested that mines can not be counted on for security or that they pose possible fratricide issues, overall, the comments supported the operational benefits identified in the literature. Nevertheless, in conjunction with the five analyses reviewed earlier, it is clear that the exact nature of the operational effects of APLs is a complicated function of many factors. Perhaps the true operational effectiveness of APLs is not so much their actual operational effectiveness but, rather, their perceived operational effectiveness - a psychological effect in and of itself.

### **Utilization of Findings**

This research appears to be the first effort of its kind. No previous study was found which measured or documented the exact nature of the psychological effects of enemy APLs on soldiers. Although only a first effort, it is hoped that this study will



serve as a valuable description of the psychological effects of APLs to which alternative concepts may be compared. In terms of the development and evaluation of APL alternatives, there are five primary conclusions:

1. The major factors involved in the psychological effects of APLs suggest elements that would be necessary to incorporate in alternatives that aim to replicate the psychological effects of APLs. Specifically, it appears that alternatives need to be a threat that the enemy would deem unable to control and would involve a high degree of uncertainty and risk. Another critical element appears to be that the enemy would be unable to "fight back" against the alternative.
2. Exact replication of the fear associated with APLs appears to hinge on the permissible lethality and maiming capability of alternatives. The results of this research suggest that exact replication of the psychological effects of APLs is likely possible only if alternatives have maiming and lethality capability. If such capabilities are not permitted, the results of this research suggest that it is likely impossible to exactly replicate all of the psychological effects of APLs and may be very difficult to replicate any of them.
3. In the development of APL alternatives, it should be noted that exact replication of some or all of the psychological effects of APLs is not the only option. Overall, this study concludes that, operationally, APLs constrain and slow, but they accomplish this through many different ways as well as through the cascading nature of their effects. Perhaps alternatives exist or can be developed which replicate the final operational effect(s) with or without the psychological one(s). For example, suppose that, in a given situation, APLs induce fear that ultimately slows soldier movement. If soldier movement can be slowed to the same degree by some other means, has not the operational objective been met? It is possible that different means may be needed to replicate different operational effects. Furthermore, the type of mission may play a role in the desired operational effect and achievement of it. Finally, expecting any type of alternative to completely stop a mission may be unrealistic given that APLs themselves typically do not.
4. The believed operational effectiveness of APLs may be one of their most powerful psychological effects. Thus, any alternative should have high efficacy in the minds of the force that is using it.
5. At the time of this report, alternative concepts are only in the conceptual stage and the U.S. military and global community do not, as yet, have comprehensive alternatives to APLs. It is wholly possible that APL alternatives may introduce a new collection of psychological effects, not apparent at this point, onto the battlefield of the future. Study of these possibly new effects may reveal that exact replication of the psychological effects of APLs is actually unnecessary. Van Williams (1998) examined the role that nonlethal technologies can play in meeting the requirements for battlefield shaping and force protection. Van Williams concluded that not only can fully developed and appropriately packed nonlethal weapons replace the conventional landmine, but they can also give a commander revolutionary new options which were never possible before. Thus, as supported by Van Williams, this study concludes that a comprehensive ban on the use of APLs and the employment of



alternatives may, ultimately, force a paradigm shift in U.S. military strategy and operation.

### **Future Research**

As, apparently, the first study of its kind, this project could not reveal every detail regarding the psychological effects of APLs. Although this research has done much to document what is meant by the "psychological effect" of APLs, it also suggests several topics for future research.

1. This study attempted solely to identify the psychological effects of APLs or elements thereof. No attempt was made to quantify those effects. Future research could attempt such quantification in order to determine, for example, which effects are most common or the reliability of effects.
2. This study focused on identifying the psychological effects of APLs rather than attempting to identify the causes of those effects. In order to be better able to replicate the effects in alternatives, it is important to understand the exact nature of the causes of those effects. Although this research provided some insights, future research should attempt to concretely identify and isolate the specific factors related to specific effects.
3. This study focused on the psychological effects of enemy APLs on U.S. soldiers. Given that APL alternatives developed by the U.S. will be intended for use on non-U.S. soldiers, it is important to determine if the psychological effects on foreign soldiers are different. In addition, although some respondents offered insights regarding the psychological effects of U.S. APL use on U.S. soldiers, future research could specifically investigate the psychological effects of APLs on the force using them.
4. Future research could examine if the psychological effects differ based on branch or rank. As one respondent put it, "It is my opinion that few soldiers above the grade of Captain really experience the events and subsequent emotions engendered by APL in the detail necessary to meaningfully portray the effects on an individual or unit." Because individuals at different ranks and in different branches engage in different tasks and have different experiences, it is possible that they are affected differently by APLs. Such insights may lead to different alternatives targeted at different groups of soldiers or soldiers performing different tasks.
5. This study wholly relied on respondent recall of their experiences with APLs. In some cases, a considerable amount of time had elapsed between the event(s) and completion of the survey. Although one respondent noted, "My recollections... are generally pretty clear. Almost like they happened yesterday," it is well documented in the memory literature that human memory is quite fallible, even for salient events. Although this is not believed to be a major shortcoming of this study, future research could attempt to assess immediate psychological effects in a controlled setting, perhaps using some sort of objective measure.
6. Although the respondents in this study had experiences with APLs in a variety of situations/conflicts, a thorough examination and comparison of the psychological effects in different situations/conflicts may provide additional insight into the effects

of APLs. Furthermore, future research could also investigate the effects of repeated experiences with APLs on both individual soldiers and entire units.

## References

- Adde, N. (1998, June 15). Former brass support ban. *Army Times*, pp. 12, 14.
- Arms Project of Human Rights Watch & Physicians for Human Rights. (1993). *Landmines: A deadly legacy*. New York: Human Rights Watch.
- Barrow, R.H., Boomer, W.E., Chapman, L.F., Jr., Crist, G.B., Davis, R.G., Davison, M.S., Foss, J.W., Gray, A.M., Haig, A.M., Jr., Kelley, P.X., Kroesen, F.J., Luck, G.E., Maddox, D.M., Mundy, C.E., Otis, G.K., RisCassi, R.W., Saint, C.E., Starry, D.A., Sullivan, G.R., Vessey, J.W., Wagner, L.C., Jr., Went, J.J., Westmoreland, W.C., & Wilson, L.H. (1997, July 21). *An open letter to President Clinton* (Publications of the Center for Security Policy No. 97-P 101 (Attachment)). Available on the World Wide Web at <http://www.security-policy.org/papers/1997/97-P101at.html>
- Battelle Memorial Institute. (1948). *Manual of mines and booby traps of the far east* (DTIC No. ADA804378). Columbus, OH: Battelle Memorial Institute, Remote Area Conflict Information Center.
- Biddle, S.D., Klare, J.L., & Rosenfeld, J. (1994, June). *The military utility of landmines: Implications for arms control* (IDA Document D-1559, DTIC No. ADA283061). Alexandria, VA: Institute for Defense Analyses.
- Biddle, S.D., Klare, J.L., Oelrich, I., & Wallis, J. (1996, May). *Landmine arms control* (IDA Paper P-3001, DTIC No. ADA315050). Alexandria, VA: Institute for Defense Analyses.
- Bier, G.L., Grzyb, S.W., & Stevens, M.M. (1998, June). Understanding and expanding the U.S. Military Role in Humanitarian Demining Operations. *Landpower Essay Series*. Arlington, Virginia: Association of the U.S. Army's Institute of Land Warfare.
- Boulden, L.H. (1997). Harvest season. *Bulletin of the Atomic Scientists*, 53(5), 30-35.
- Cahill, K.M. (1995). *Clearing the fields: Solutions to the global land mines crisis*. New York: BasicBooks.
- Carroll, P.W. (1988). *Mine and boobytrap warfare: Lessons forgotten* (DTIC No. ADA194094). Carlisle Barracks, PA: U.S. Army War College.
- Department of the Army. (1992, September 30). *Field Manual 20-32: Mine/Countermine Operations*. Washington, D.C.: Department of the Army.

- Department of the Army. (1994, August 30). *Field Manual 21-16/Fleet Marine Force Manual 13-8-1: Unexploded ordnance (UXO) procedures* Washington, D.C.: Department of the Army.
- Department of the Army. (1998, May 29). *Field Manual 20-32: Mine/Countermine Operations*. Washington, D.C.: Department of the Army.
- Funk, D.E. (1998). *A mine is a terrible thing to waste: The operational implications of banning anti-personnel landmines* (DTIC No. ADA357010). Fort Leavenworth: Army Command and General Staff College.
- Goldberg, C. (1997, October 11). Peace prize goes to land-mine opponents. *The New York Times*, 147(50942), pp. A1, A6.
- Greenwalt, B. & Magnoli, D. (1997). *Examination of the battlefield utility of antipersonnel landmines and the comparative value of proposed alternatives*. Lawrence Livermore National Laboratory: author.
- Greer, W.L. & Bartholomew, J. (1986). The psychology of mine warfare. U.S. Naval Institute *Proceedings, February*, 58-62.
- Holmes, R. (1985). *Acts of war: The behavior of men in battle*. New York: The Free Press.
- Human Rights Watch Arms Project & Human Rights Watch/Africa. (1994). *Landmines in Mozambique*. New York: Human Rights Watch.
- International Committee of the Red Cross. (1995) *The worldwide epidemic of landmine injuries: the ICRC health oriented approach*. [Brochure]. Geneva: Author.
- International Committee of the Red Cross. (1996). *Anti-personnel landmines: Friend or Foe?* Geneva: Author.
- Jegen, M.E. (1997). Mines different from victim's viewpoint. *National Catholic Reporter*, 34(1), 9-10.
- Johnson, R.H. (1995). Why mines? A military perspective in *Clearing the Fields* (K.M. Cahill, ed.). New York: BasicBooks and the Council on Foreign Relations.
- Jones, D., Galvin, J.R., Schwarzkopf, H.N., Tuttle, W.G.T., Jr., Warner, V.F., Woerner, F.F., Jr., Abrahamson, J., Emerson, H.E., Gard, R.G., Jr., Hollingsworth, J.F., Moore, H.G., Jr., Palmer, D.R., Smith, D.C., Jr., Shanahan, J., & Kinnard, D. (1996, April 3). An open letter to President Clinton. *The New York Times*, p. A11.

- Kirkland, F.R., Halverson, R.R., & Bliese, P.D. (1996). Stress and psychological readiness in post-cold war operations. *Parameters*, Summer 1996, 79-91.
- Klemencic, J.V. (1998). *United States Policy for Anti-Personnel Landmines* (DTIC No. ADA345447). Carlisle Barracks, PA: U.S. Army War College.
- Lambert, J.M. (1952). Tin triangles. *The Royal Engineers Journal*, LXVI(12), 328-338.
- Leahy, P. (1997). December in Ottawa. *Bulletin of the Atomic Scientists*, 53(5), 4.
- Mahoney, D.P. (1996). *Goalie without a mask? The effect of the anti-personnel landmine ban on U.S. Army countermobility operations* (DTIC No. ADA324323). Fort Leavenworth: Army Command and General Staff College.
- May, J.G. (1998). *New technology required to implement U.S. anti-personnel landmine policy* (DTIC No. ADA342303). Carlisle Barracks, PA: U.S. Army War College.
- Nelson, S.S. (1996, January 29). Land-mine injuries offer single choice: amputation. *Army Times*, p. 16.
- O'Brien, E. (1994). The land mine crisis: A growing epidemic of mutilation. *Lancet*, 344(8936), 1522.
- Patton, G. (1975). *War as I knew it*. Boston: Houghton Mifflin.
- Schneck, W.C., Visser, M.H., & Leigh, S. (1993a, April). Advances in mine warfare: An overview. *Engineer*, 23(PB 5-93-2), 2-6.
- Schneck, W.C., Visser, M.H., & Leigh, S. (1993b, August). Advances in mine warfare: Antipersonnel Mines. *Engineer*, 23(PB 5-93-3), 26-33.
- Skolnick, A.A. (1997). Planting the world's killing fields. *Journal of the American Medical Association*, 278(5), 376.
- Sloan, C.E.E. (1986). *Mine warfare on land*. London: Brassey's Defence Publishers.
- Stover, E., Keller, A.S., Cobey, J., & Sopheap, S. (1994). The medical and social consequences of land mines in Cambodia. *Journal of the American Medical Association*, 272(5), 331-336.
- Strada, G. (1996). The horror of land mines. *Scientific American*, 274(5), 40-45.
- Supplee, T.B. (1998). *Not without risk: Operational analysis of a landmine ban* (DTIC No. ADA349337). Newport, Rhode Island: Naval War College, Joint Military Operations Department.

U.S. Department of State, Political-Military Affairs Bureau, Office of International Security Operations. (1993). *Hidden killers: The global problem with uncleared landmines - A report on international demining*. Washington, D.C.: Department of State.

U.S. Department of State, Bureau of Political-Military Affairs, Office of International Security and Peacekeeping Operations. (1994). *Hidden killers: The global landmine crisis*. Washington, D.C.: U.S. Department of State.

Van Williams, T. (1998). *Filling an operational requirement: The nonlethal approach* (DTIC No. ADA348576). Newport, Rhode Island: Naval War College.

Vinson, N. (1998). The demise of the anti-personnel mine: A military perspective. Royal United Services Institute for Defence Studies (*RUSI Journal*, 143(1), 18-23.

Webster, D. (1994). One leg, one life at a time. *The New York Times Magazine*, January 23, 1994, section 6, 26-33.

White House, Office of the Press Secretary. (1997, September 17). *Fact Sheet: U.S. efforts to address the problem of anti-personnel landmines*. Available through the White House Virtual Library at <http://www.whitehouse.gov>

## Appendix 1 - Survey

If you

(a) are on active duty OR are former or retired military

AND

(b) have been deployed OCONUS in an area where anti-personnel landmines were present, please continue reading.

I am Dr. Eugenia Kolasinski and I am conducting research for the U.S. Army's Project Manager Mines, Countermine, and Demolitions. I am requesting your cooperation in completing a very brief survey regarding the effects of Anti-Personnel Landmines. Your input is very important and can directly affect the development of Anti-Personnel Landmine Alternatives. USMA-wide distribution of this survey was approved by the Office of Policy, Planning, and Analysis.

In September 1997, President Clinton announced that, to bring the United States more closely in line with the Ottawa Convention, use of Anti-Personnel Landmines (APLs) will end by the year 2003 (2006 for Korea). To meet this goal, efforts are currently underway for the awarding of contracts for assessment testing, engineering, and, eventually, production of APL Alternatives (APLAs).

Employment of APLAs will almost surely change the battlefield of the future. It is desired that Alternatives have the same psychological effects as Anti-Personnel Landmines without the negative humanitarian aspects. However, this brings up the underlying question *What are the psychological effects of Anti-Personnel Landmines?* In order to replicate the psychological effects of Anti-Personnel Landmines, their effects must first be identified.

A review of the literature has provided some insights into the effects of APLs. However, formal literature is only one part of the picture. Personal insights from individuals who have dealt with APLs are a very valuable contribution to this research effort. It is in this capacity that I am seeking your input. Please note that completion of this survey is voluntary. The survey is very brief and is estimated to take approximately 15 minutes. Please reply as soon as possible, but replies will be accepted through 31 August 1998.

First, please provide some biographical information. Although your responses will be incorporated into the final report, names and other identifying information will not be used.

Current Rank: \_\_\_\_\_

Current Branch: \_\_\_\_\_

Experiences with anti-personnel landmines:

Situation(s)/Conflict(s): \_\_\_\_\_

Rank at that time: \_\_\_\_\_

Branch at that time: \_\_\_\_\_

Now, please answer the following two questions with regard to your experience(s) with anti-personnel landmines (APLs). The questions are very open-ended and you may provide as much or as little detail as you wish. Telling of "war stories" is encouraged! Remember that you will not be identified in the final report.

(1) Think about the situation(s) or conflict(s) in which you and/or your soldiers encountered anti-personnel landmines or the threat of them. Briefly describe the situation(s)/conflict(s). How did the presence or believed presence of APLs affect you? For example, what emotions did they invoke? How were others around you acting? What did you think about the situation? The emphasis in this question is on psychological effects to the individual (in contrast to question 2).



(2) Think again about the situation(s) or conflict(s) you described above. How did the presence or believed presence of anti-personnel landmines affect the mission? For example, was the mission changed or delayed? Did they impact your actions and, if so, how? If in combat, did they affect the battle? The emphasis in this question is on operational effects to the mission.

Thank you very much for your cooperation! Your contribution is truly valuable to this research effort. A report of the results of this study should be ready by the end of the calendar year. In addition, a Faculty Call will be given sometime during the academic year in the Department of Behavioral Sciences & Leadership describing this study and its findings.

Would you like to be notified when the final report is ready? ☐ yes ☐ no  
Would you like to be notified of the BS&L Faculty Call? ☐ yes ☐ no